

Reclaiming Our Technological Future • Privacy & Technology

NASA Goes To Ground • Transgenic Plants

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WHOLE EARTH REVIEW

No. 73 Winter 1991

ACCESS TO TOOLS & IDEAS

Questioning Technology

Jerry Mander

J. Baldwin

Linda Garcia

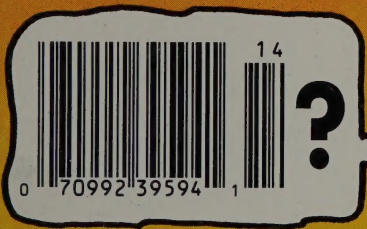
Langdon Winner

Amory & Hunter Lovins

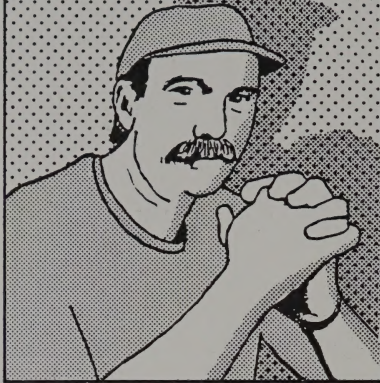
Patricia Schuman

Peter Calthorpe

Ivan Illich



"TECHNOLOGY IS NOT THE SOURCE OF OUR PROBLEMS," I WROTE ON THIS PAGE IN WER#70. WHAT IF I WAS WRONG?



WHAT IF TECHNOLOGY IS THE SOURCE OF OUR PROBLEMS, BUT WE HAVE BEEN BRAIN-WASHED (AND ACTIVELY BRAINWASH OURSELVES) TO DENY THE OBVIOUS: OUR ADDICTION TO DESTRUCTIVE TECHNOLOGIES IS DOING US IN.



MAYBE IT'S TIME TO RETHINK "ACCESS TO TOOLS?"



IF WE SET ASIDE our fascination with automobiles, telephones, microwave ovens and color televisions for a moment, perhaps the least-deluded interpretation we could make of this century's technological revolutions is this: Modern technology makes millions of people as rich as sultans at the expense

of many more millions of other people who live near some of the resources that must be extracted from the Earth in order for the whole system to continue to produce profits. The system feeds on the Earth itself, and is addicted to growth. Sounds cancerous, doesn't it?

Jerry Mander started me thinking these taboo thoughts. Mander's book, *In the Absence of the Sacred: The Failure of Technology and the Survival of the Indian Nations*, reviewed in WER #72 and excerpted in this issue, provided a framework for understanding the elements of the social and economic and physical system that has grown up around technology:

In the hands of the cultural machines known as corporations, every major technology, no matter how useful it might appear for humane purposes, has contributed momentum to a planet-wide process that appears to be leading to a great extinction, possibly within a few decades.

The ability of those who control the key points of leverage in the system to increase their control is enhanced by the nature of some of the tools themselves — the media.

Some of the technologies that make people a lot of money are also capable of lulling people into uncritical consumer consciousness. This system is misunderstood by many, because the benefits of most technologies are immediately obvious (and advertising agencies are paid well to make them obvious) while their side effects might be as invisible

as they are destructive (and comparatively little money is spent educating people about those effects). Every day, clever people use powerful communication tools to convince us that we need to buy more cars, bigger refrigerators, more powerful computers, automated kitchens, smart houses, supersonic transports.

We've all been looking at technology through a narrowly focused lens, a way of seeing that has something to do with the "single vision and Newton's sleep" William Blake warned us about when he saw the preparations for the Industrial Revolution. When we depend upon electricity and electronics, antibiotics and traffic lights, we are powerfully influenced to see parts of the world in a certain way, and discouraged from seeing it in other ways. The fact that technologies entail more than machines, that they involve a complex web of economic incentives, power relations, resources, side effects, by-products, means that we have to learn how to use something more like a compound lens to look at the world we are allowing to be built around us.

The authors of the articles in this issue don't represent a particular school or movement; to the contrary, they hold a broad range of opinions, and disagree on many things. But they are people who have been grappling with our changing attitudes toward technology. We have assembled these different perspectives and turned them on our most fundamental assumption — that access to tools is a good and noble service to provide.

These articles aren't prescriptions. They are pointers. When enough people point their attention in the right direction, powerful things can happen. Perhaps among our readers will be one or two or more who will be inspired to create new tools for thinking about tools. —Howard Rheingold

IS TECHNOLOGICAL INNOVATION INVARIABLY BENEFICIAL?

HELL YES! WHAT'S GOOD FOR BUSINESS IS GOOD FOR AMERICA!



In The Absence Of The Sacred (p. 4)

SHOULD THE POTENTIAL RISKS AND/OR BENEFITS OF SCIENTIFIC RESEARCH BE A MATTER OF PUBLIC DEBATE?

DON'T BE RIDICULOUS. WE KNOW WHAT WE'RE DOING.



Renegotiating Science's Contract (p. 30)

DOES THE USE OF SOPHISTICATED NEW TECHNOLOGY BY CREDIT AGENCIES, MARKET RESEARCHERS AND OTHERS THREATEN INDIVIDUAL RIGHTS TO PRIVACY?

OF COURSE NOT.

WHAT'S THE MATTER-- YOU GOT SOMETHIN' TO HIDE?

SUBJECT: JOHN DOE
ANNUAL INCOME: \$24,000
TOTAL DEBT: \$4,000
RENT PAYMENTS: \$500
SEXUAL ORIENTATION: HETERO



Privacy And Technology (p. 90)

WILL OUR DEPENDENCE UPON OIL TO FUEL OUR TECHNOLOGIES MAKE ANOTHER GULF WAR INEVITABLE?

I'M NOT AT LIBERTY TO DISCUSS THAT MATTER AT THIS TIME.

ANY OTHER QUESTIONS?



Winning The Peace (p. 60)

WILL NEW METHODS OF PROCESSING INFORMATION MAKE BOOKS AND LIBRARIES OBSOLETE?

YOU BET! WE'RE GOING TO HAVE A PAPERLESS SOCIETY-- ANY DAY NOW!



Reclaiming Our Technological Future (p. 74)

...AND... DO WE CONTROL NEW TECHNOLOGIES-- OR DO THEY CONTROL US?

DON'T BOTHER ME! MY WORK RATE IS BEING MONITORED!

YOU WANT TO GET ME FIRED?



Artifact/Ideas And Political Culture (p. 18)

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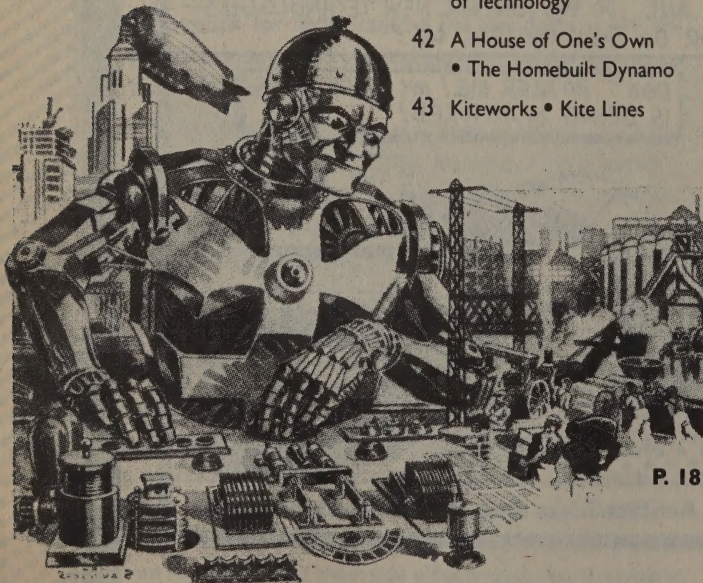
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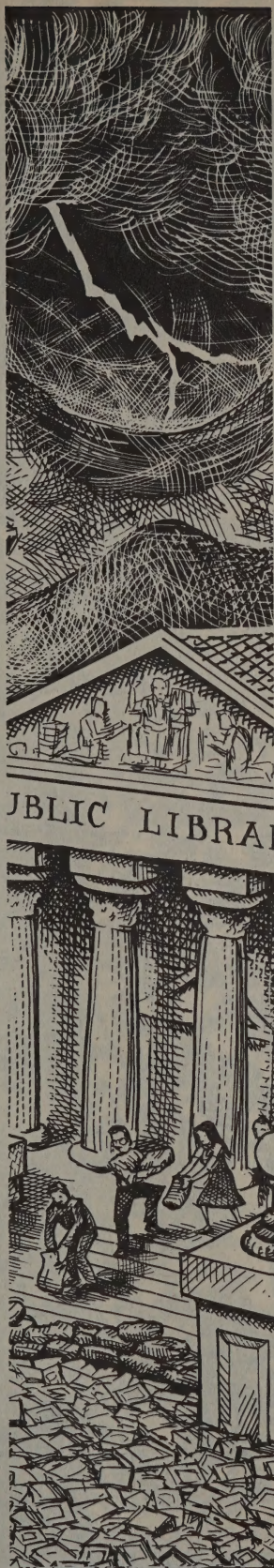
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COVERS: Brad Hamann's special touch with technology was a natural choice for this issue's front cover.

The Digital Shaded-Relief Map of the Conterminous United States (back cover) is the work of Gail P. Thelin and Richard Pike of the U.S. Geological Survey. The 36" x 55" original, with explanatory booklet, should be available soon for approximately \$5 (order #I-2206) from U.S. Geological Survey, Map Distribution, Box 25046, DFC, Denver, CO 80255; 303/236-5250.

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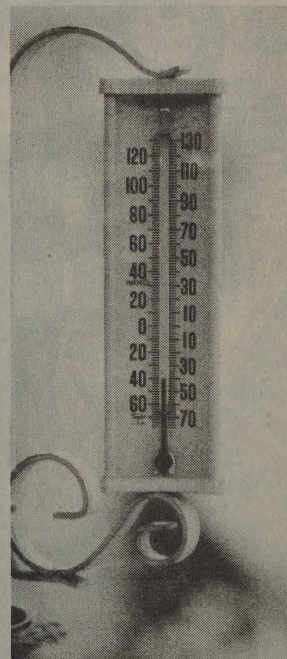


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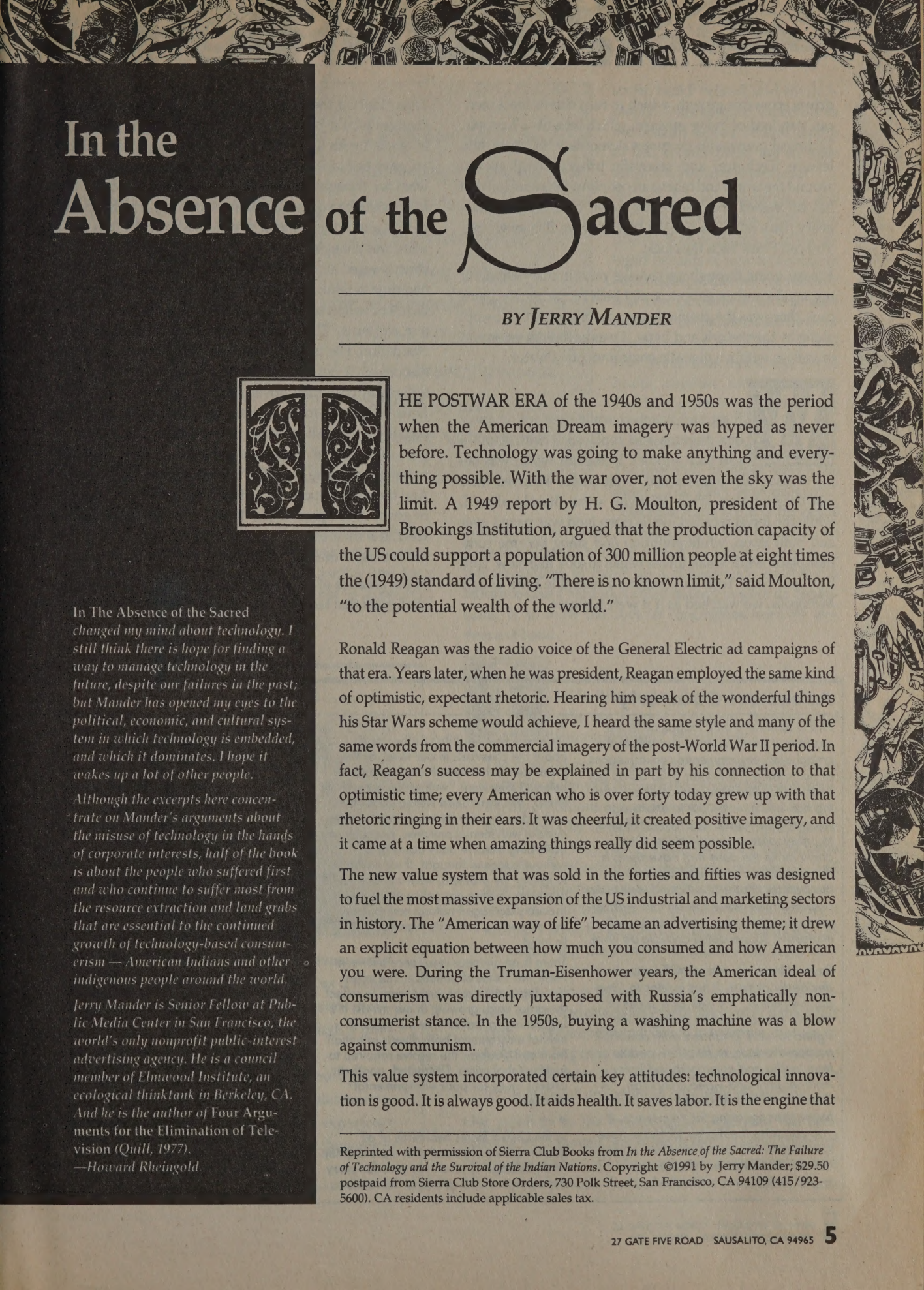
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ILLUSTRATION BY TOM TEITGE



In the Absence of the Sacred

BY JERRY MANDER



THE POSTWAR ERA of the 1940s and 1950s was the period when the American Dream imagery was hyped as never before. Technology was going to make anything and everything possible. With the war over, not even the sky was the limit. A 1949 report by H. G. Moulton, president of The Brookings Institution, argued that the production capacity of the US could support a population of 300 million people at eight times the (1949) standard of living. "There is no known limit," said Moulton, "to the potential wealth of the world."

In The Absence of the Sacred changed my mind about technology. I still think there is hope for finding a way to manage technology in the future, despite our failures in the past; but Mander has opened my eyes to the political, economic, and cultural system in which technology is embedded, and which it dominates. I hope it wakes up a lot of other people.

Although the excerpts here concentrate on Mander's arguments about the misuse of technology in the hands of corporate interests, half of the book is about the people who suffered first and who continue to suffer most from the resource extraction and land grabs that are essential to the continued growth of technology-based consumerism — American Indians and other indigenous people around the world.

Jerry Mander is Senior Fellow at Public Media Center in San Francisco, the world's only nonprofit public-interest advertising agency. He is a council member of Elmwood Institute, an ecological thinktank in Berkeley, CA. And he is the author of Four Arguments for the Elimination of Television (Quill, 1977).

—Howard Rheingold

Ronald Reagan was the radio voice of the General Electric ad campaigns of that era. Years later, when he was president, Reagan employed the same kind of optimistic, expectant rhetoric. Hearing him speak of the wonderful things his Star Wars scheme would achieve, I heard the same style and many of the same words from the commercial imagery of the post-World War II period. In fact, Reagan's success may be explained in part by his connection to that optimistic time; every American who is over forty today grew up with that rhetoric ringing in their ears. It was cheerful, it created positive imagery, and it came at a time when amazing things really did seem possible.

The new value system that was sold in the forties and fifties was designed to fuel the most massive expansion of the US industrial and marketing sectors in history. The "American way of life" became an advertising theme; it drew an explicit equation between how much you consumed and how American you were. During the Truman-Eisenhower years, the American ideal of consumerism was directly juxtaposed with Russia's emphatically non-consumerist stance. In the 1950s, buying a washing machine was a blow against communism.

This value system incorporated certain key attitudes: technological innovation is good. It is always good. It aids health. It saves labor. It is the engine that

Reprinted with permission of Sierra Club Books from *In the Absence of the Sacred: The Failure of Technology and the Survival of the Indian Nations*. Copyright ©1991 by Jerry Mander; \$29.50 postpaid from Sierra Club Store Orders, 730 Polk Street, San Francisco, CA 94109 (415/923-5600). CA residents include applicable sales tax.

drives economic growth, which in turn drives the American standard of living upward, which benefits all people. Technical innovation promotes democracy, freedom, and leisure. Technical and scientific progress will spread around the world and relieve all people of the awful toil that has oppressed them since the dawn of time. Someday, every place will look like the World's Fair. It is inevitable. You can't turn back the clock.

For me, going through my teenage years in that period; for my family and neighbors; and, I believe, for most Americans, there was the disposition to go along with it all. Swept along by the rhetoric and hype, it was as though we found ourselves within a gigantic environmental theater.



WE sat and watched while they rolled away one diorama and replaced it with another and then another. While our world was being dramatically transformed, while places we loved were fast deteriorating, while lifestyles were sharply altered, while the forest receded, while open land was paved over and built upon, while pollution and smog became commonplace, while small towns began to look like New York City and New York City began to resemble Fritz Lang's *Metropolis*, we watched as if it were a movie.

To say that we, the public, had no participation in these vast changes would be inaccurate. We lived in the world; we interacted with the changing environment. By our silence we gave our tacit approval. But no one ever inquired into what we thought about it all. No one ever indicated that there could be a question about the process. It all happened so fast, and with so much power, it was difficult to grasp what was changing, as it was changing. The process itself overpowered all doubt. We asked no questions. We never had time to think it through. Even if we'd had the time, we didn't have the thoughts or the words by which to articulate our concerns. There was no language of technological evaluation, nor is there one now. The parameters of the discussion, even the parameters of thought, were pre-defined by corporate, governmental, and scientific institutions. No formal means existed by which ordinary people could engage in discussions or debates, or could hear the pros and cons of what was happening. There were no national referenda, save for what appeared in the media. And the media reports were mainly confined to advertising or government predictions. If there existed an alternative view, it remained within intellectual circles not visible to the average American.

In the absence of an alternative vision, the paradigm was confirmed that technological innovation was good, invari-

Adbusters Quarterly

This is surely the only magazine in the world that takes as its central theme the cataclysmic environmental consequences of advertising. Now over \$100 billion per year in the US alone, consumer advertising has little function but to encourage people to buy more and more stuff and to universalize material values. One could make the case that advertising is the root cause, or at least the driving mechanism, for the horrific and increasing assault on the world's resources. Adbusters makes that case, and does so with impressive scope, detail and joie de vivre.

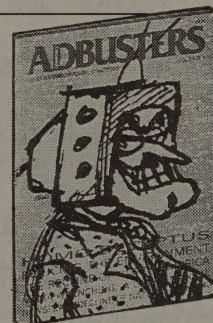
Beyond mere reportage, Adbusters is decidedly activist. It has guides to "media wrenching," as well as a series of sharply hilarious media strategies designed to work in tandem with already-prepared videos, to help free people from media and commodity addiction. Another print-and-video campaign, "A Tree Farm Is Not A Forest," offers rain-forest trees speaking for themselves. If you can raise the money to place these spots on the air, or the print ads in magazines, Adbusters will provide them to you free.

—Jerry Mander

• Ten years ago we didn't bother much about the chemicals in our food, or the toxins generated by industry because we believed they were "well within acceptable limits." We were dead wrong about that, and today we may be repeating the same mistake with mental pollution, nonchalantly absorbing massive daily doses of it without a second thought. If we continue to ignore the problem, we may soon find ourselves dealing not only with an irretrievably damaged natural environment, but also with a seriously impaired public mind.

There is an ominous resonance between these two forms of pollution. The holes growing in the ozone layer seem to reflect the great voids growing in our minds. It's frightening to realize how our polluted mental environment both diverts attention from and weakens the resolve required to tackle global crises. Distracted, apathetic citizens make for poor environmental stewards.

• In the United States two-thirds of all doctor-patient visits end with a prescription — an average of seven per year for every American. . . . It is precisely this relation-



Adbusters Quarterly

Kalle Lasn and Cat Simril, Editors.

\$16/year (\$US; 4 issues) from Adbusters Media Foundation, 1243 W. 7th Avenue, Vancouver, BC V6H 1B7, Canada

ship that drug companies exploit in their advertising to doctors. In Canada last year, they did it to the tune of \$33 million in journal advertising alone. Open any of the dozens of medical journals, and you will see that two-thirds of it is full-color advertising imploring doctors to prescribe, to prescribe *their* drug, and to prescribe it now.

ably good, and would be the principal means by which our society would solve its problems and produce a better world.

Fifty years later, however, as the world hurtles toward its greatest environmental crisis since the dawn of human life, a crisis driven by the insatiable need to feed resources to the technological machine, and to consume them as commodities, we are at an appropriate moment to question whether this path we have chosen and celebrated has lived up to its promise, and if not, if it ever will.



LEWIS Mumford said that the "horn of plenty," i.e., the un-

limited material goods that technological society promises, qualifies as a "magnificent bribe" meant to get us to overlook what has been lost in the bargain. Isn't it time for a society-wide debate on whether the costs — economic,

In the absence of an alternative vision, the paradigm was confirmed that technological innovation was good, invariably good, and would be the principal means by which our society would solve its problems and produce a better world.

social, health-related, and environmental — are justified, especially as the benefits (speed, leisure, length of life, commodities) are so marginal and perhaps superficial?

No such debate is taking place, and no such conclusions have been drawn. Bizarre claims as to the alleged benefits of new technologies continue to proliferate. We still hear that new generations of machines will solve the problems left by prior generations of machines. We still hear predictions that a new era of health, comfort, security, leisure, and happiness is just around the corner if only we deepen our commitment to technology.

The operating homilies remain the same: "You can't stop progress." "Once the genie is out of the bottle you cannot put it back." "Technology is here to stay, so we have to find ways to use it better." In reality, these are all rationalizations to cover up a culture-wide passivity; a failure to take a hard look at technology in all of its dimensions, or to draw the obvious conclusions from the evidence at hand.



IN *The Whale and the Reactor*, Langdon Winner calls our current condition "technological somnambulism." He goes on:

The most interesting puzzle in our times is that we so willingly sleepwalk through the process for reconstituting the conditions of human existence. . . . Why is it that the philosophy of technology has never really gotten under way? Why has a culture so firmly based upon countless sophisticated instruments, techniques, and systems remained so steadfast in its reluctance to examine its own foundations? . . . In the twentieth century it is usually taken for granted that the only reliable sources for improving the human condition stem from new machines, techniques, and chemicals. Even the recurring environmental and social ills that have accompanied technological advancement have rarely dented this faith. . . . We are seldom inclined to examine, discuss, or judge pending innovations. . . . In the technical realm we repeatedly enter into a series of social contracts, the terms of which are revealed only after the signing.

Our passivity to the technological juggernaut has been ongoing for millennia. Some find its roots in agriculture and husbandry. Others cite the emergence of patriarchy. And there is surely a case that the scientific revolution, which

SELF ESTEEM.

dial

Are you glad you use Dial?
Do all you wish everybody did!

For a commercial to work, the audience must accept two premises: first, that life as it exists is inadequate and inferior; and second, that improvement can be obtained through a purchased product or service.

Think of it. The commercial encourages young viewers to identify those inadequacies in their own lives. What a learning experience for young people still not sure who they are or where they fit in.

articulated a mechanistic view of nature and humanity, altered the prevailing views of life and encouraged fascination with and dependence upon the machine. Whatever the historical roots, we are now embedded in a system of perceptions that make us blind and passive when it comes to technology. I think the following factors are major contributors to the problem:

DOMINANCE OF BEST-CASE SCENARIOS

The most obvious problem is the manner in which technology is introduced to us. The first waves of description are invariably optimistic, even utopian. This is because in capitalist societies all early descriptions of new technologies come from their inventors, and the people who stand to gain from their accep-

Because technology is now everywhere apparent, pervasive, and obvious, we lose awareness of its presence. While we walk on pavement, or drive on a freeway, or sit in a shopping mall, we are unaware that we are enveloped by a technological and commercial reality, or that we are moving at technological speed.

tance. Whether in advertisements, public relations presentations, or at landmark events like World's Fairs, the information we are given describes the technologies solely in terms of their best-case use. This is so even when the inventors have significant knowledge of terrible down-side possibilities. It is logical that inventors and corporate and government marketers present only idealized, glamorized versions of technology, since they have no stake in the public being even dimly aware of negative potentials — the worst-case scenarios — though negative results are at least as likely to occur as positive results. Nuclear power is the single exception to this pattern. It has had a somewhat rougher road than other technologies because the public was aware of its worst-case potentials from the moment we first heard about it, at Hiroshima. If we

The Myth of the Market

In the year of the so-called triumph of capitalism over communism, there is at last one book, published in England, that questions whether market economies have lived up to their advertising about themselves, and concludes that they have not. Far from delivering Utopia, market economics has brought maldistribution of wealth, overuse of resources, overproduction of wastes, the breakdown of planetary support systems, the commoditization of all experience, dehumanization, corporate domination, and welfare dependency. The Eastern European countries might be well advised to seek some third alternative, before they are cloned. —Jerry Mander

To critics of the markets, its defenders will sooner or later say 'Well what would you put in its place?' This conundrum should more properly be thrown back at the advocates of the system themselves; what are they proposing to put in place of the exhausted earth, the depleted resources, the contaminated water and vitiated air? If it had been the purpose of humanity on earth to bring to the edge of ruin the planet itself, no more efficient mechanism could have been invented than the market system

itself, with its prodigious use of energy and materials in the sublime mission of replacing as much of human activity with commodities and the monetary transactions that attend them. The market should play a minimal and functional role in our lives; and to those who ask what should we then do, the answer is: expel the market

from all those spaces it has inappropriately invaded, reclaim autonomy and self-reliance wherever this is possible. The market cannot create social justice, it is powerless to distinguish between good and evil; it has no moral role, even less should it be the object of the curious cults that have grown around its mythic power in the West.

Everywhere in the world, alternatives have been suppressed, and continue to be destroyed at an accelerating pace in the face of its invasive power, the most deadly of all colonizations, because it insinuates itself into the spirit and the imagination of people. In its presence, older patterns of self-reliance and non-monetized ways of answering human need are being eliminated. The inferiorizing of traditional customs and patterns of living, the images of 'backwardness', the curse of 'underdevelopment' are part of the same global spectacle — the subordination of the most shining examples of self-reliance to the spread of the Western system. Whatever the benefits of a single global-market, the survival of alternatives will not be one of them. This suggests a level of total control to dwarf all previous tyrannies and totalitarianisms; the dictatorship of the market.



The Myth of the Market

Jeremy Seabrook, 1990; 189 pp.

Available in January 1992 from Seven Hills Book Distribution, 49 Central Avenue, Cincinnati, OH 45202; 800/545-2005

had known the worst-case potentials of television, or automobiles, or computers or pesticides or robotics or genetics, doubts might have emerged about those technologies as well, and thus slowed their progress.

TECHNOLOGY'S Pervasiveness AND Invisibility

Marshall McLuhan told us to think of all technology in environmental terms because of the way it envelops us and becomes difficult to perceive. From morning to night we walk through a world that is totally manufactured, a creation of human invention. We are surrounded by pavement, machinery, gigantic concrete structures. Automobiles, airplanes, computers, appliances, television, electric lights, artificial air have become the physical universe with which our senses interact. They are what we touch, observe, react to. They are themselves "information," in that they shape how we think and, in the absence of an alternate

reality (i.e., nature), what we think about and know.

As we relate to these objects of our own creation, we begin to merge with them and assume some of their characteristics.

Workers on an assembly line, for example, must function at the speed of the line, submitting to its repetitive physical and mental demands. When we drive a car, we are forced to focus our minds and bodily reactions on being at one with the road and the machine: following the curves, moving through the landscape at appropriate speeds. The more we spend our lives in this manner, the more these interactions define the perimeters of our experience and vision. They become the framework of our awareness.

There is a paradox, however. Because technology is now everywhere apparent, pervasive, and obvious, we lose awareness of its presence. While we walk on pavement, or drive on a freeway, or sit in a shopping mall, we are unaware that we are enveloped by a technological and commercial reality, or that we are moving at technological

Stone Age Economics

This book is subversive to so many of the fundamental assumptions of Western technological society that it is a wonder it was permitted to be published. Calling on extensive research among the planet's remaining stone-age societies — in Africa, Australia, and Southeast Asia — as well as anecdotal reports from early explorers, Chicago University Professor Marshall Sahlins directly challenges the idea that Western civilization has provided greater "leisure," or "affluence," or even greater economic reliability, than "primitive" hunter-gatherers. He concludes that far from being on the edge of starvation and having to devote all their time to survival, preindustrial peoples usually satisfied their basic needs in 3-4 hours per day and spent the rest of their time hanging around, flirting, creating art, music, and games, and sleeping. Sahlins also argues persuasively that subsistence-based societies clearly preferred their lives to more settled agricultural ways. He offers extensive research showing that they consistently under-produced, in terms of the maximum carrying capacity of their environments, just so they would have the ability to move around without dragging surplus food or commodities, and as a means of keeping population down. A Bushman is quoted: "Why should we plant when there are so many mongomongo nuts in the world?"

Sahlins charges establishment anthropologists and economists with creating

imaginary horror scenarios for the purpose of making our society look good by comparison. He describes the traditionally dismal view of the hunter-gatherers' existence as "most congenial for the task of depriving him of the same." In other words, if they ever let it out that subsistence societies "lived banker's hours," as Sahlins puts it, certain questions might arise as to why we stole their lands, paved them, and work 40-50 hours/week, seeking leisure.

—Jerry Mander




Stone Age Economics

Marshall Sahlins, 1972; 348 pp.

\$19.95 (\$23.45 postpaid) from Aldine de Gruyter/Order Dept., 200 Saw Mill River Road, Hawthorne, NY 10532; 914/747-0110

• When Herskovits was writing his *Economic Anthropology* (1958), it was common anthropological practice to take the Bushmen or the native Australians as "a classic illustration of a people whose economic resources are of the scantiest," so precariously situated that "only the most intense application makes survival possible." Today the "classic" understanding can be fairly reversed — on evidence largely from these two groups. A good case can be made that hunters and gatherers work less than we do; and, rather than a continuous travail, the food quest is intermittent, leisure abundant, and there is a greater amount of sleep in the daytime per capita per year than in any other condition of society.

• The manufacture of tools, clothing, utensils, or ornaments, however easily done, becomes senseless when these begin to be more of a burden than a comfort. Utility falls quickly at the margin of portability. The construction of substantial houses likewise becomes absurd if they must soon be abandoned. Hence the hunter's very ascetic conceptions of material welfare: an interest only in minimal equipment, if that, a valuation of smaller things over bigger; a disinterest in acquiring two or more of most goods; and the like. Ecological pressure assumes a rare form of concreteness when it has to be shouldered. If the gross product is trimmed down in comparison with other economies, it is not the hunter's productivity that is at fault, but his mobility.



speed. We live our lives in reconstructed, human-created environments; we are *inside* manufactured goods.

We do not easily grasp technology from the outside, or in McLuhan's terms, "extraenvironmentally." And once we accept life within a technically mediated reality, we become less aware of anything that preceded it. We have a hard time imagining life before television or cars. We do not remember a United States of mainly forests and quiet. The information that nature offers to our minds and to our senses is nearly absent from our lives. If we do seek out nature, we find it fenced off in a "park," a kind of nature zoo. We need to make reservations and pay for entry, like at a movie. It's little wonder that we find incomprehensible any societies that choose to live within nature.

With each new generation of technology, and with each stage of technological expansion into pristine environments, human beings have fewer alternatives and become more deeply immersed within technological consciousness. We have a harder time seeing our way out. Living constantly inside an environment of our own invention, reacting solely to things we ourselves have created, we are essentially living *inside our own minds*. Where evolution was once an interactive process between human beings and a natural, unmediated world, evolution is now an interaction between human beings and our own artifacts. We are essentially coevolving with ourselves in a weird kind of intraspecies incest.

NO notion more completely confirms our technological somnambulism than the idea that technology contains no inherent political bias. From the political Left and Right, from the corporate world and the world of community activism, one hears the same homily: "The problem is not with technology itself, but with how we use it, and who controls it." This idea would be merely preposterous if it were not so widely accepted, and so dangerous. In believing this, however, we allow technology to develop without analyzing its actual bias. And then we are surprised when certain technologies turn out to be useful or beneficial only for certain segments of society.

A prime example is nuclear energy, which cannot possibly move society in a democratic direction, but *will* move society in an autocratic direction. Because it is so expensive and so dangerous, nuclear energy must be under the direct control of centralized financial, governmental, and military institutions. A nuclear power plant is not something that a few neighbors can get together and build. Community control is anathema. Even control by city or state governments is proving impossible, as is now obvious to those locales attempting to block the movement and disposal of radioactive wastes within their borders.

The existence of nuclear energy, and nuclear weaponry, in turn requires the existence of what Ralph Nader has called a new "priesthood"—a technical and military elite capable of guarding nuclear waste products for the approximately 250,000 years that they remain dangerous. So if some future society, tiring of the present path, should determine to move away from a centralized technological society and

Report from the Frontier

This is an exhaustive report on the condition (as of 1987) of several hundred of the world's surviving native nations. Covering all continents, the book gives historical accounts of the arrival of the colonial powers, the suppression of autonomy, the alienation from native lands and customs, and the current situation. The reports include peoples who have experienced relatively little impact, e.g., certain Amazon nations; those who only recently came under assault, as in New Guinea, the Philippines, Borneo, and the far north; and those indigenous populations who have been subsumed by invader societies. This latter category is the largest, of course, including hundreds of native nations in Indonesia, China, India, Africa, South America, the United States and Canada, and such newsworthy struggles as those in Tibet, Kurdistan, Irian Jaya (West Papua), Ethiopia, Sudan, Guatemala, and the Amazon. Whatever the degree of impact that the native peoples are facing, common themes are clear in their struggles. Each is attempting to maintain cultural identity, political autonomy, and traditional economy in the face of the resource drives of the larger countries.

*Population tables, maps, chronologies, resource guides and other helpful devices make **Report from the Frontier** an absolutely basic document for anyone seeking to grasp the big picture on the situation of native peoples on the planet today. If there is a negative to report, it is only*

that some of the situations have changed rapidly during the past several years, and a few reports are dated.

—Jerry Mander

Indonesia recognizes 1.5 million tribes-people officially, with the eastern province of Irian Jaya (West Papua) the most heavily populated, followed by Kalimantan (Borneo), Sulawesi and Sumatra. The tribal peoples are described in the 1945 constitution as those communities inhabiting remote areas 'whose social life, economic performance and level of civilization are below acceptable standards'.



Report from the Frontier

Julian Burger, 1987; 310 pp.

\$15 (\$17.50 postpaid) from Cultural Survival, 53A Church Street, Cambridge, MA 02138; 617/495-2562

toward, say, an agrarian society, it would be impossible. The technical elite would need to remain, if only to deal with the various wastes left behind. So it is fair to say that nuclear technology *inherently* steers society toward greater political and financial centralization, and greater militarization.

"HOLISTIC" CRITICISM

I don't think I realized when I began working on *Four Arguments for the Elimination of Television* in 1973 that the project was really a stab at creating a new holistic language by which to discuss television and

From the political Left and Right, from the corporate world and the world of community activism, one hears the same homily: "The problem is not with technology itself, but with how we use it, and who controls it." This idea would be merely preposterous if it were not so widely accepted, and so dangerous.

other technologies. It did not even occur to me at the beginning to advocate *no* television, but merely to broaden the terms used to discuss it, so that all possible dimensions of impact could be included: political, social, economic, biological, perceptual, informational, epistemological, spiritual; its effects upon kids, upon nature, upon power, upon health. A totality of effects, hence a "holistic" viewpoint.

I did place particular emphasis on the negative potentials of television — the worst-case possibilities — since those were absent from most prior analyses. Whatever criticism of television existed at that time

Of all the menaces to indigenous peoples in the world, few can be as poignant or as urgent as that threatening the one million or so Melanesian people of West Papua. It is possible with legitimacy to talk about genocide elsewhere — the Mayan Indians in Guatemala, the Ache in Paraguay, the Chakma and other tribal peoples in Bangladesh — but even in the context of such violence the destruction of the West Papuan people has few parallels. More particular-

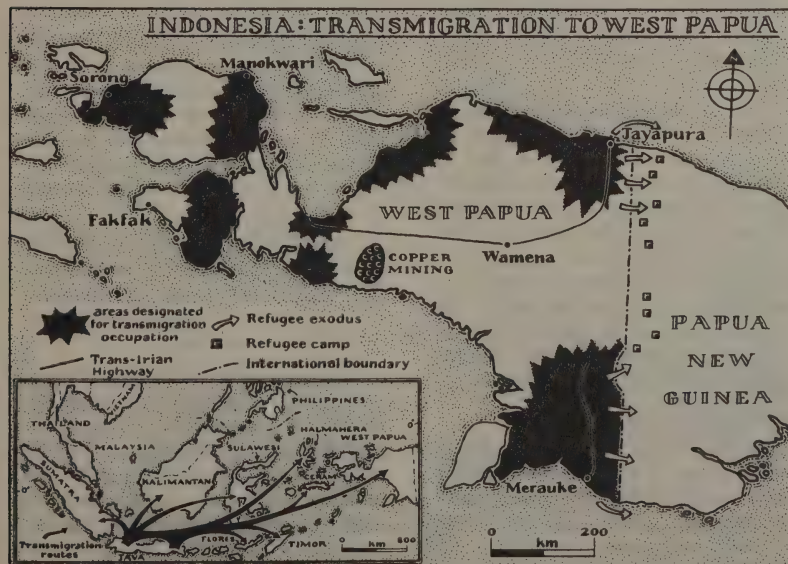
ly since until very recently the Papuans have had relatively little contact with invading powers and are now experiencing a particularly aggressive and racist colonization from Indonesia. The tragedy is compounded because history is repeating itself so evidently. The invasions of the Americas and especially Australia are being reborn in West Papua, only this time aided by the United Nations and the general assembly of nation states.

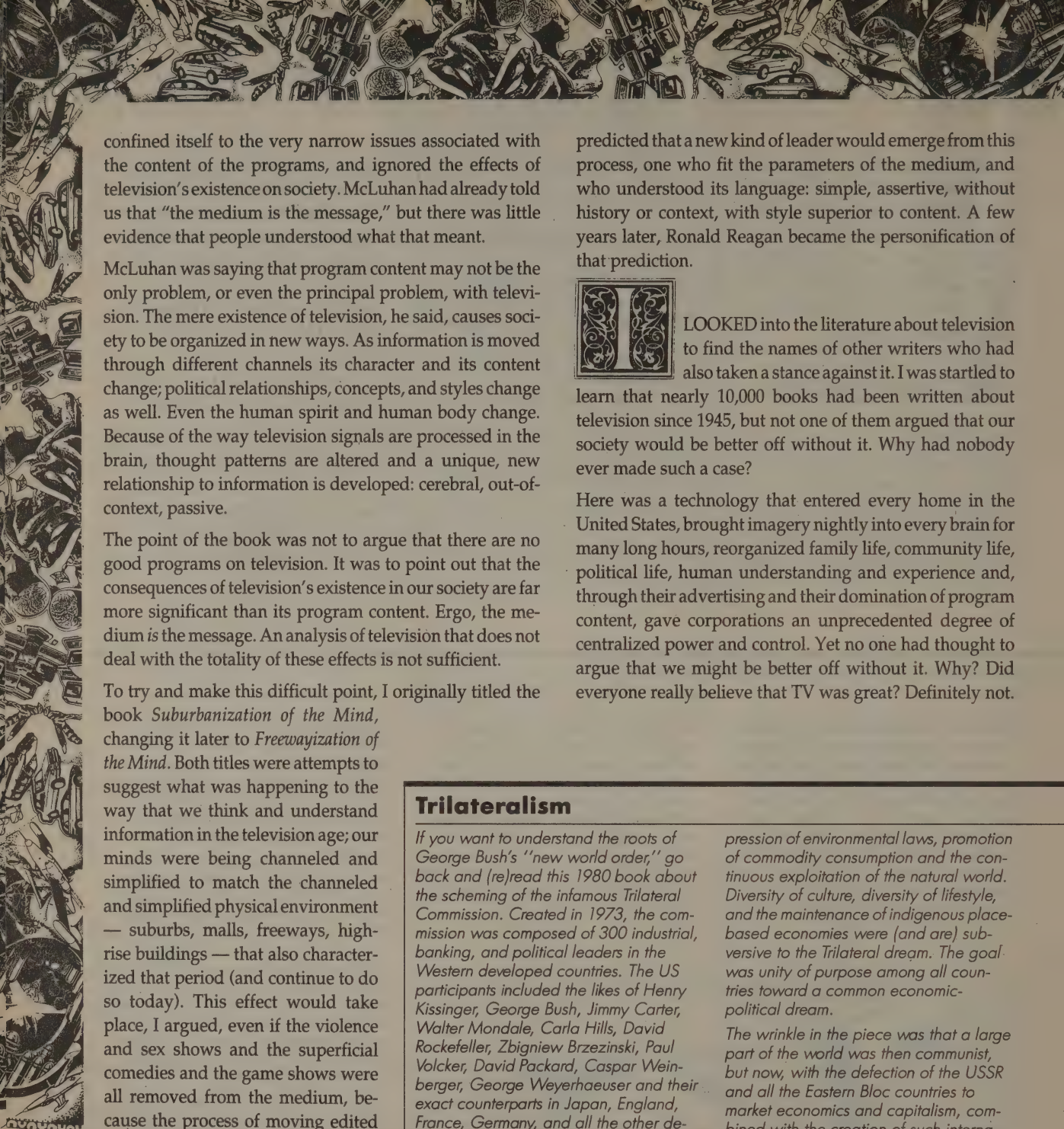
Nomadic pastoralism is a highly flexible way of life suited to fragile marginal scrublands. Pastoralists range from purely nomadic groups who travel across the Sahel more or less continuously, locating pockets of pasture and trading, to the semi-nomadic peoples who move their cattle between two regions. . . .

By their successful adaptation to the conditions of the semi-desert regions and their reciprocity with local settled farming communities, pastoralists were able in the past to survive long periods of drought and withstand famine. The pastoralist way of life, far from being an inefficient and primitive mode of production, has proved to be a most effective system for survival and even prosperity. One agricultural adviser has made this comment about the present economic system:

The only form of life which does not threaten the Sahelian environment is nomadism. The continuous movement of men and animals allows vegetation to replenish itself and does not threaten water resources and the grazing land around them.

Yet today the nomadic pastoralists must face serious problems on various fronts. Their grazing lands are being reduced, their traditional rights to the land and water resources are being eroded, the control of herds, pastures and water is increasingly falling into the hands of outsiders and their political power is diminished as they find themselves for the most part a minority people within states dominated by urban elites.





confined itself to the very narrow issues associated with the content of the programs, and ignored the effects of television's existence on society. McLuhan had already told us that "the medium is the message," but there was little evidence that people understood what that meant.

McLuhan was saying that program content may not be the only problem, or even the principal problem, with television. The mere existence of television, he said, causes society to be organized in new ways. As information is moved through different channels its character and its content change; political relationships, concepts, and styles change as well. Even the human spirit and human body change. Because of the way television signals are processed in the brain, thought patterns are altered and a unique, new relationship to information is developed: cerebral, out-of-context, passive.

The point of the book was not to argue that there are no good programs on television. It was to point out that the consequences of television's existence in our society are far more significant than its program content. Ergo, the medium *is* the message. An analysis of television that does not deal with the totality of these effects is not sufficient.

To try and make this difficult point, I originally titled the book *Suburbanization of the Mind*, changing it later to *Freewayization of the Mind*. Both titles were attempts to suggest what was happening to the way that we think and understand information in the television age; our minds were being channeled and simplified to match the channeled and simplified physical environment — suburbs, malls, freeways, high-rise buildings — that also characterized that period (and continue to do so today). This effect would take place, I argued, even if the violence and sex shows and the superficial comedies and the game shows were all removed from the medium, because the process of moving edited images rapidly through a passive human brain was so different from active information gathering, whether from books or newspapers or walks in nature. As a result people would become more passive, less able to deal with nuance and complexity, less able to read or create. People would get "dumber," and have less understanding of world events even within an exploding information environment. The book

predicted that a new kind of leader would emerge from this process, one who fit the parameters of the medium, and who understood its language: simple, assertive, without history or context, with style superior to content. A few years later, Ronald Reagan became the personification of that prediction.



LOOKED into the literature about television to find the names of other writers who had also taken a stance against it. I was startled to learn that nearly 10,000 books had been written about television since 1945, but not one of them argued that our society would be better off without it. Why had nobody ever made such a case?

Here was a technology that entered every home in the United States, brought imagery nightly into every brain for many long hours, reorganized family life, community life, political life, human understanding and experience and, through their advertising and their domination of program content, gave corporations an unprecedented degree of centralized power and control. Yet no one had thought to argue that we might be better off without it. Why? Did everyone really believe that TV was great? Definitely not.

Trilateralism

If you want to understand the roots of George Bush's "new world order," go back and (re)read this 1980 book about the scheming of the infamous Trilateral Commission. Created in 1973, the commission was composed of 300 industrial, banking, and political leaders in the Western developed countries. The US participants included the likes of Henry Kissinger, George Bush, Jimmy Carter, Walter Mondale, Carla Hills, David Rockefeller, Zbigniew Brzezinski, Paul Volcker, David Packard, Caspar Weinberger, George Weyerhaeuser and their exact counterparts in Japan, England, France, Germany, and all the other developed countries. No partisan squabbling in this crowd. They were all in agreement on a philosophy of development and organization that placed the economic elites in charge of a one-world economic plan, which would eventually have all places looking like San Jose, California.

They got together a few times each year and developed strategies for influencing their own countries, and all others, for smoothing the pathways toward unlimited industrial production, an unhindered free-trade system, free flow of resources, sup-

pression of environmental laws, promotion of commodity consumption and the continuous exploitation of the natural world. Diversity of culture, diversity of lifestyle, and the maintenance of indigenous place-based economies were (and are) subversive to the Trilateral dream. The goal was unity of purpose among all countries toward a common economic-political dream.

The wrinkle in the piece was that a large part of the world was then communist, but now, with the defection of the USSR and all the Eastern Bloc countries to market economics and capitalism, combined with the creation of such international monoliths as the IMF, the World Bank, and the General Agreement on Tariffs and Trade, worldwide homogenization under transnational corporate control is a realizable goal.

This is the ultimate conspiracy book; a conspiracy made more plausible by the fact that the conspirators are not military or fascist zealots; they are men and women who graduated from good schools, who want world peace and two cars in every garage, whether in Des Moines, the jungles of New Guinea, or on Mars. The book confirms that the world is run

But everyone *was* caught up in the narrow idea that programs were television's only problem; the solution was simply to produce better programs, to slip new ideas into the medium.

There was yet a deeper resistance. Saying no to a technology, *any* technology, was (and still is) beyond us. Virtually unthinkable. It does not even occur to most of us that we have the right or ability to turn back a whole technology. No precedent and no support exists for it in our culture.

In a truly democratic society, any new technology would be subject to exhaustive debate. That a society must retain the option of declining a technology — if it deems it harmful — is basic. As it is now, our spectrum of choice is limited to mere acceptance. The real decisions about technological introduction are made by only one segment of society: the corporate, based strictly on con-

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siderations of profit. This is clearly antithetical to the democratic process.



At the turn of the century the car was portrayed as a harbinger of personal freedom and democracy: private transportation that was fast, clean (no mud or manure), and independent. But what if the public had also known about the negative properties of the car? What would have been the outcome?

What if the public had been told that the car would bring with it the modern concrete city? Or that the car would contribute to cancer-causing air pollution, to noise, to solid-waste problems, and to the rapid depletion of the world's resources? What if the public had been made aware that a nation of private car owners would require the virtual paving of the entire landscape, *at public cost*, so that

eventually automobile sounds would be heard even in wilderness areas? What if it had been realized that the private car would only be manufactured by a small number of giant corporations, leading to their acquiring tremendous economic and political power? That these corporations would create a new mode of mass production — the assembly line — which in turn would cause worker alienation, injury, drug abuse, and alcoholism? That these corporations might conspire to eliminate other means of popular transportation, including trains? That the automobile would facilitate suburban growth, and its impact on landscapes? What if there had been an appreciation of the psychological results of the privatization of travel and the modern experience of isolation? What if the public had been forewarned of the unprecedented need for oil that the private car would create? What if the world had known that, because of cars, horrible wars would be fought over oil supplies?

Would a public informed of these

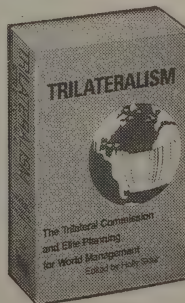
by a small group of wealthy corporate types, who are in conceptual agreement and who get together to help move the whole ship forward. Their names, addresses, and affiliations are dutifully noted.
—Jerry Mander

Consumption is the locomotive of profit. In 1968 *Forbes* magazine (which proudly calls itself the "Capitalist Tool") featured the views of Nabisco's president, Lee Bickmore, on shaping "one world" of homogeneous consumption. Bickmore captured the corporate dream, looking forward to the day when

Arabs and Americans, Latins and Scandinavians will be munching Ritz crackers as enthusiastically as they already drink Coke or brush their teeth with Colgate.

Trilateralists look forward to a pseudo postnational age in which social, economic, and political values originating in the trilateral regions are transformed into universal values. Expanding networks of like-minded government officials, businessmen, and technocrats — elite products of Western education — are to carry out national and international policy formation.

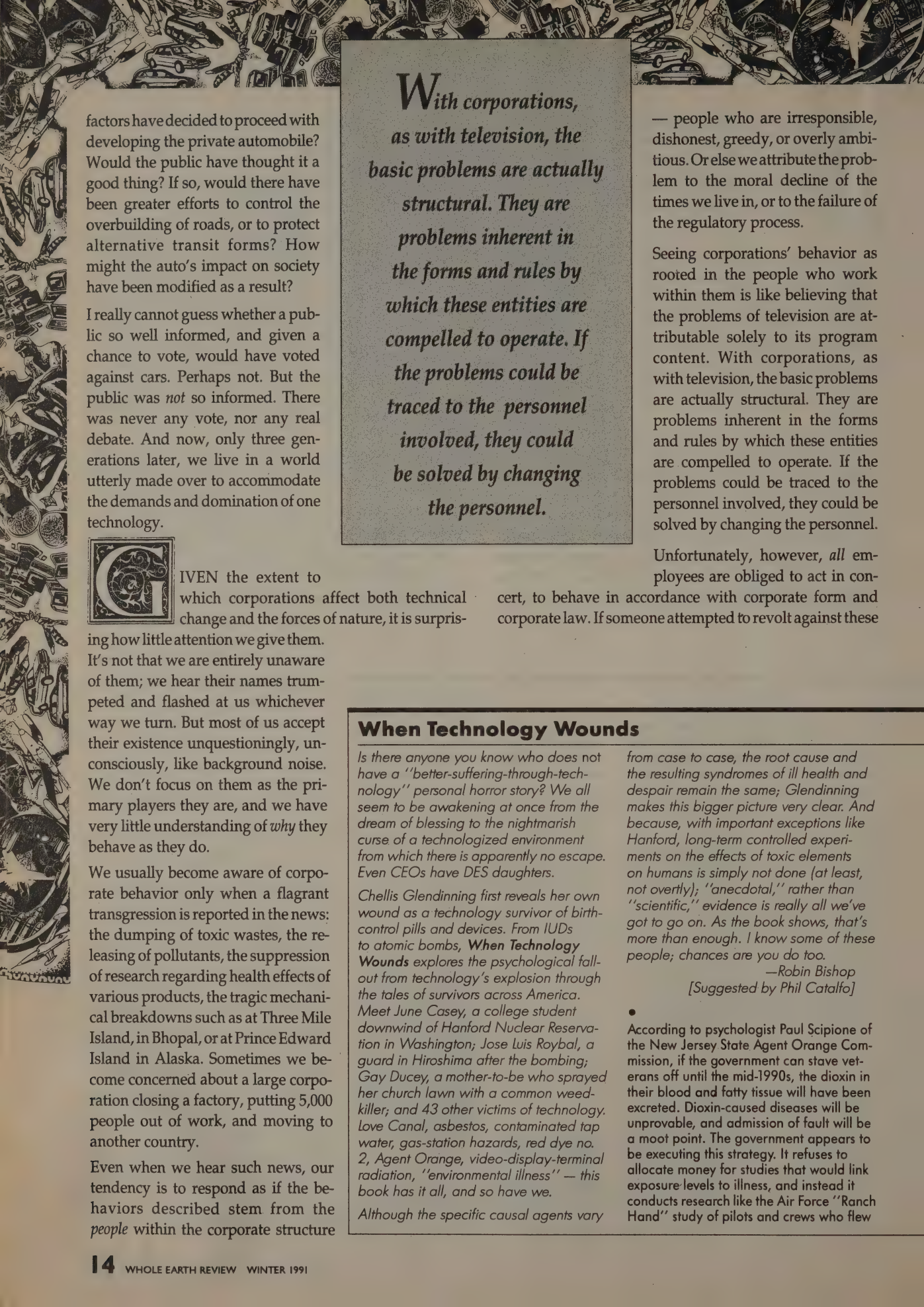
Countries are continually bombarded with images of the fantasy American Dream. In countless ways the message of the dominant system penetrates: the Western Way is the good way, national culture is inferior. This is the meaning of cultural penetration or cultural imperialism. Mass advertising, Voice of America radio, educational sponsorships are all designed to shape tastes, beliefs, practices, and aspirations in the image of the West. Foreign economic and military aid are less subtle means of influencing other countries.



Trilateralism

Holly Sklar, Editor. 1980; 604 pp.

\$20 (\$23 postpaid) from South End Press, P. O. Box 741, Monroe, ME 04951; 800/533-8478 (or Whole Earth Access)



factors have decided to proceed with developing the private automobile? Would the public have thought it a good thing? If so, would there have been greater efforts to control the overbuilding of roads, or to protect alternative transit forms? How might the auto's impact on society have been modified as a result?

I really cannot guess whether a public so well informed, and given a chance to vote, would have voted against cars. Perhaps not. But the public was *not* so informed. There was never any vote, nor any real debate. And now, only three generations later, we live in a world utterly made over to accommodate the demands and domination of one technology.



GIVEN the extent to which corporations affect both technical change and the forces of nature, it is surpris-

ing how little attention we give them. It's not that we are entirely unaware of them; we hear their names trumpeted and flashed at us whichever way we turn. But most of us accept their existence unquestioningly, unconsciously, like background noise. We don't focus on them as the primary players they are, and we have very little understanding of *why* they behave as they do.

We usually become aware of corporate behavior only when a flagrant transgression is reported in the news: the dumping of toxic wastes, the releasing of pollutants, the suppression of research regarding health effects of various products, the tragic mechanical breakdowns such as at Three Mile Island, in Bhopal, or at Prince Edward Island in Alaska. Sometimes we become concerned about a large corporation closing a factory, putting 5,000 people out of work, and moving to another country.

Even when we hear such news, our tendency is to respond as if the behaviors described stem from the people within the corporate structure

With corporations, as with television, the basic problems are actually structural. They are problems inherent in the forms and rules by which these entities are compelled to operate. If the problems could be traced to the personnel involved, they could be solved by changing the personnel.

— people who are irresponsible, dishonest, greedy, or overly ambitious. Or else we attribute the problem to the moral decline of the times we live in, or to the failure of the regulatory process.

Seeing corporations' behavior as rooted in the people who work within them is like believing that the problems of television are attributable solely to its program content. With corporations, as with television, the basic problems are actually structural. They are problems inherent in the forms and rules by which these entities are compelled to operate. If the problems could be traced to the personnel involved, they could be solved by changing the personnel.

Unfortunately, however, *all* employees are obliged to act in concert, to behave in accordance with corporate form and corporate law. If someone attempted to revolt against these

When Technology Wounds

Is there anyone you know who does not have a "better-suffering-through-technology" personal horror story? We all seem to be awakening at once from the dream of blessing to the nightmarish curse of a technologized environment from which there is apparently no escape. Even CEOs have DES daughters.

*Chellis Glendinning first reveals her own wound as a technology survivor of birth-control pills and devices. From IUDs to atomic bombs, **When Technology Wounds** explores the psychological fallout from technology's explosion through the tales of survivors across America. Meet June Casey, a college student downwind of Hanford Nuclear Reservation in Washington; Jose Luis Roybal, a guard in Hiroshima after the bombing; Gay Ducey, a mother-to-be who sprayed her church lawn with a common weed-killer; and 43 other victims of technology. Love Canal, asbestos, contaminated tap water, gas-station hazards, red dye no. 2, Agent Orange, video-display-terminal radiation, "environmental illness" — this book has it all, and so have we.*

Although the specific causal agents vary

from case to case, the root cause and the resulting syndromes of ill health and despair remain the same; Glendinning makes this bigger picture very clear. And because, with important exceptions like Hanford, long-term controlled experiments on the effects of toxic elements on humans is simply not done (at least, not overtly); "anecdotal," rather than "scientific," evidence is really all we've got to go on. As the book shows, that's more than enough. I know some of these people; chances are you do too.

—Robin Bishop
[Suggested by Phil Catalfo]

• According to psychologist Paul Scipione of the New Jersey State Agent Orange Commission, if the government can stave veterans off until the mid-1990s, the dioxin in their blood and fatty tissue will have been excreted. Dioxin-caused diseases will be unprovable, and admission of fault will be a moot point. The government appears to be executing this strategy. It refuses to allocate money for studies that would link exposure levels to illness, and instead it conducts research like the Air Force "Ranch Hand" study of pilots and crews who flew

tenets, it would only result in the corporation throwing the person off, and replacing that person with another who would act according to the rules. Form determines content. Corporations are machines.



HE failure to grasp the nature and inevitabilities of corporate structure has left our society far too unconscious and passive to corporate desires, and has helped corporations increase their influence, power, and freedom from accountability. Corporations already influence our conceptions of how life should be lived more than any other institution, including government. Corporate ideology, corporate priorities, corporate styles of behavior, corporate value systems, and corporate modes of organization have become synony-

Corporate ideology, corporate priorities, corporate styles of behavior, corporate value systems, and corporate modes of organization have become synonymous with "our way of life." Corporate "culture" has become the virtual definition of American life, to be defended at all costs, even militarily.

You dress and behave according to corporate concepts, you interact with the machines by which corporations accom-

plish their tasks — computers, typewriters, telephones, fax machines, copiers. You spend your day living within corporate rhythms.

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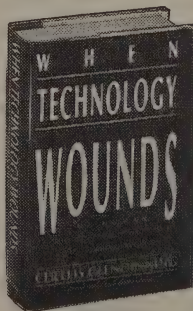
plish their tasks — computers, typewriters, telephones, fax machines, copiers. You spend your day living within corporate rhythms.

spraying missions, a study that may not be concluded until the year 2002. By that time dioxin levels in surviving veterans will be impossible to detect, and most veterans who currently have Hodgkin's disease, lymphoma, or the neurological disorders thought to be associated with dioxin will be dead.

I went to my son's pediatrician, and I said, "Look, there are eight patients who have you as their doctor. All of them are under the age of twelve, all of them have a similar urinary disorder. Why is this? What do you make of the fact that you have eight patients who live within a few blocks of Love Canal who have the same disease?!" He said, "There is no connection."
—Lois Gibbs, Love Canal resident

When Jane Woolf found out that the well water she had been drinking at her home in Michigan was contaminated by a gasoline leak across the highway, she also learned that the benzene in the gas could cause leukemia. "I was extremely worried," she says. "I had an overwhelming fear of death gnawing at me. Just thoughts run-

ning through my mind all the time. Who will I make my will out to? I wonder if I'll ever have any kids? I wonder if I'll ever have a family life?"



When Technology Wounds

Chellis Glendinning, 1990; 285 pp.

\$18.95 (\$20.45 postpaid) from William Morrow and Co./Wilmore Warehouse, 39 Plymouth Street, Fairfield, NJ 07004; 800/843-9389 (or Whole Earth Access)

nant educational institution in our country, surely in the realm of lifestyle.

The average American now views 21,000 commercials every year. Twenty-one thousand times, corporations place images in your brain to suggest something great about commodities. Some commercials advertise cars, others advertise drugs — but all commercials agree that you should buy something, and that human life is most satisfying when inundated with commodities. Between commercials there are programs, also created by corporations, that espouse values consistent with the ads.

Corporations are also the major providers of educational materials for American schools. Some of the

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largest corporations now provide books, tapes, films, and computer programs free of charge to public and private schools, as a “public service” in these budget-conscious times. They get a lot of praise for these contributions. Oil and chemical companies have been particularly generous in providing materials to help explain nature to young people: materials that portray nature as a valuable resource for human use, and that celebrate concepts like “managing nature” through chemicals, pesticides, and large-scale agribusiness. Thus a generation of youngsters is trained to regard nature in a way that coincides with corporate objectives. They are also trained to accept corporate interpretations and perspectives from a very early age, and are thereby prepared for what is to come. ☺

The American Replacement of Nature

This is a great rabid rant about what America, technology, and the new religion of Disneyism are doing to the world. I don't agree with a lot of it but the part I agree with has changed a lot of my former enthusiasms for the wonders of technology, and redirected large chunks of my attention to the man behind the curtain. It's undeniable that the quick-cut, sound-bite, fast-food, Disneyland-sanitized, corporate-sponsored world-as-constructed-experience has replaced a lot of real estate that used to be occupied by the real — forest or desert.

As usual, you can't judge Thompson's book as a logical argument; you have to enjoy it as a full-frontal assault by an enraged and literate thinker. The prose isn't always lucid, but the diatribes hit some very interesting targets dead center.

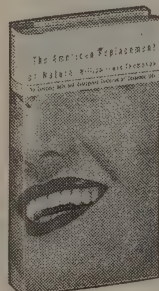
—Howard Rheingold

Technologies will become ensouled, just as souls become denatured and shifted into collective lattices rather than into the animal-hominid bodies of old evolutionary times. “Demons” will be able to take human form, and souls will be able to dwell in cognitive lattices, so it is small wonder that today's science-fiction landscape of novels and computer games is filled with mythologies of dungeons and dragons, monsters and devils. This paranoia

is crazy, but the caricatured sketch reveals an isomorphism to an evolutionary meta-noia that is beyond anything we could call normal. One can clue into this phenomenon of cultural evolution through the paranoid caricatures of the fundamentalists — who curiously seem to object to the Luciferic New Agers more than the Ahrimanic technologists in computer science — or one can clue into it through cyberpunk fiction, or one can get more than a clue if one reads Steiner and realizes that what one is looking at in the new electronic

America so celebrated and hyped by Stewart Brand and Howard Rheingold is a collectivization that can be mythologically identified as the incarnation of the demon Ahriman.

The logo for this, the world's first multinational corporation, was not a happy mouse, but an instrument of execution. Martyrs were its heroes and sources of inspiration for countless paintings that often went into gruesome detail of the frying or dismemberment of God's most favored ones. Churches were intimidating spaces of much darkness and little light, great echoing vaults in which the leftovers of martyrdom were saved as relics to impress the unthinking and cure the faithful. By governing the body through the power of an overwhelming and impossible denial of its physical existence, the Church took control of life at its deepest roots of sex and death. But it would be the future that it presumed to control that would undo it, and while its attention was focused on stopping intellectuals from reading forbidden books and preventing lovers from having sexual relations without the conjugal bond and a commitment to reproduction, a new prophet arose in our midst in L.A. who was so deceptively camouflaged that to this day most people think of him as an enormously successful businessman and not as the influential founder of a new world religion.



The American Replacement of Nature

William Irwin Thompson, 1991; 160 pp.

\$20 (\$22.50 postpaid) from Doubleday & Co./Fulfillment Dept., 2151 S. Wolf Road, Des Plaines, IL 60018; 800/223-6834 (or Whole Earth Access)

Images of Organization

Organization is the core collective human technology. People working together have been the bedrock of human existence ever since a group was first recognized as such by its members.

As the groups got bigger and took on new identities and forms, such as global multinationals, the drive to understand them and make them work better has been just as forceful as the parallel drive to understand and control the physical world through technology. The difference is that people — the raw material of organizations — change far more slowly and are far less predictable than the technologies they use in their work.

This book explores the range of metaphors and models we use to understand and change the way people interact. It's also an insightful tour through the changing intellectual climate of the twentieth century. —Dave Williams

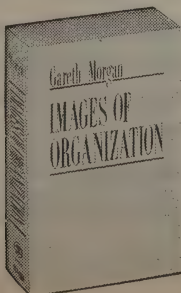
The basic premise on which [this] book builds is that our theories and explanations of organizational life are based on metaphors that lead us to see and understand organizations in distinctive yet partial ways. Metaphor is often just regarded as a device for embellishing discourse, but its significance is much greater than this. For the use of metaphor implies a way of thinking and a way of seeing that pervade how we understand our world generally. For example, research in a wide variety of fields has demonstrated that metaphor exerts a formative influence on science, on our language and on how we think, as well as on how we express ourselves on a day-to-day basis.

We use metaphor whenever we attempt to understand one element of experience in terms of another. Thus, metaphor proceeds through implicit or explicit assertions that A is (or is like) B. When we say "the man is a lion," we use the image of a lion to draw attention to the lionlike aspects of the man. The metaphor frames our understanding of the man in a distinctive yet partial way.

Images of Organization

Gareth Morgan, 1986; 432 pp.

\$19.95 (\$21.45 postpaid) from Sage Publications, P. O. Box 5084, Newbury Park, CA 91359; 805/499-0721 (or Whole Earth Access)



One of the interesting aspects of metaphor rests in the fact that it always produces this kind of one-sided insight. In highlighting certain interpretations it tends to force others into a background role. Thus in drawing attention to the lionlike bravery, strength, or ferocity of the man, the metaphor glosses the fact that the same person may well also be a chauvinist pig, a devil, a saint, a bore, or a recluse. Our ability to achieve a comprehensive "reading" of the man depends on an ability to see how these different aspects of the person may coexist in a complementary or even a paradoxical way.

It is easy to see how this kind of thinking has relevance for understanding organization and management. For organizations are complex and paradoxical phenomena that can be understood in many different ways. Many of our taken-for-granted ideas about organizations are metaphorical, even though we may not recognize them as such. For example, we frequently talk about organizations as if they were machines designed to achieve predetermined goals and objectives, and which should operate smoothly and efficiently. And as a result of this kind of thinking we often attempt to organize and manage them in a mechanistic way, forcing their human qualities into a background role.

By using different metaphors to understand the complex and paradoxical character of organizational life, we are able to manage and design organizations in ways that we may not have thought possible before. The following chapters illustrate how this can be done by exploring the implications of different metaphors for thinking about the nature of organization. While some of the metaphors tap familiar ways of thinking, others develop insights and perspectives that will be rather new.

Thus Chapter 2 examines the image of organizations as machines and illustrates how this style of thought underpins the development of bureaucratic organization. When managers think of organizations as machines they tend to manage and design them as machines made up of interlocking parts that each play a clearly defined role in the functioning of the whole. While at some times this can prove highly effective, at others it can have many unfortunate results. One of the most basic problems of modern management is that the mechanical way of thinking is so ingrained in our everyday conceptions of organization that it is often very difficult to organize in any other way. In demonstrating this, the chapter helps us to become more open to other ways of thinking.

Architect or Bee?

*Mike Cooley questions, but does not condemn, technology. A practicing engineer and Marxist social activist, he was one of the men behind the well-known Lucas Workers' Plan, an effort by aerospace workers to save their jobs by proposing 150 new products for the corporation to manufacture (management was sublimely uninterested, and eventually managed to remove Cooley and the other activists from their jobs). His vision is of a world in which technology serves people rather than vice versa, concentrating on use value rather than exchange value. Cooley believes that the mass of ordinary people can and should be involved in directing the technology they live with, and he draws on many examples where this has already happened on a small scale. Though short on consideration of the externalities of manufacturing, **Architect or Bee?** provides an exciting hint of a future in which questioning technology has become a useful and common activity for designers and workers alike.* —Mike Gunderloy

For those who do not work in the automotive industry, it is difficult to appreciate how bad the situation is becoming and to what extent workers are being paced by these computerized, high technology systems. In the section where they press out the car bodies in one car company, workers are subject to an agreement on the makeup of their rest allowance.



Architect or Bee?

(The Human/Technology Relationship)
Mike Cooley, 1980; 150 pp.

\$7 (\$10 postpaid) from South End Press, P. O. Box 741, Monroe, ME 04951; 800/533-8478 (or Whole Earth Access)

The elements are as follows:


Trips to the lavatory
1.62 minutes. It is computer precise; not 1.6 or 1.7 but 1.62!

For fatigue
1.3 minutes

Sitting down after standing too long
65 seconds

For monotony
32 seconds — and so the grotesque litany goes on.

The methods engineers located the toilets strategically close to the production line so that operators could literally flash in and flash out. What arrogance some technologist had to be able to do that to another human being! If we have strikes in the automotive industry we must not be surprised. In my view they are right to strike against conditions of this kind, yet all the time this is the kind of philosophy behind the design of much of the equipment produced for industry today.



Artifact/Ideas And Political Culture



BY
LANGDON
WINNER



HIS IS A TIME OF GREAT EXCITEMENT about the fruitful possibilities of new technology, but also a time of grave concern about what those possibilities mean for the future of our society. Horizons visible in microelectronics and photonics, biotechnology, composite materials, computing, and other fields hold out prospects of sweeping change in our way of life. How should we regard these prospects?

As individuals, groups and nations anticipate technological change nowadays, they usually focus upon three questions.

First: How will the technology be used? (What are its functions and practical benefits?)

Second: How will the technology change the economy? (What will it contribute to the production, distribution and consumption of material wealth?)

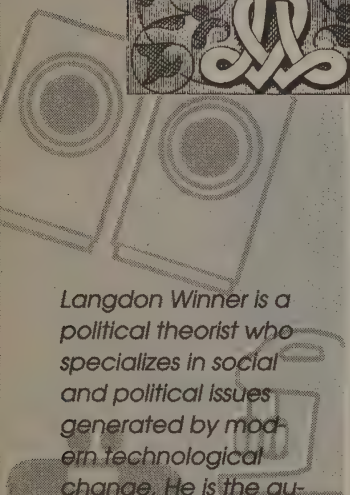
Third: How will the technology affect the environment? (What will be its consequences for global climate change, pollution of the biosphere, and other environmental problems?)

While these are important issues, another crucial question is seldom mentioned: What kind of world are we building here? As we develop new devices, techniques, and technical systems, what qualities of social, moral and political life do we create in the process? Will this be a world friendly to human sociability or not?

These are questions about the relationship of technological change to the evolution of modern political culture. In what ways do the development, adoption, and use of instrumental things affect our shared experience of freedom, power, authority, community and justice? How might we respond creatively to the role technology plays in contemporary political life?

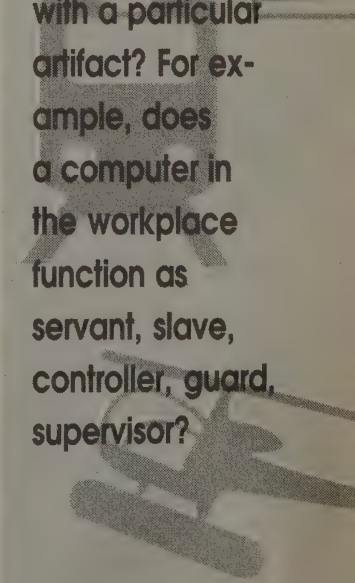
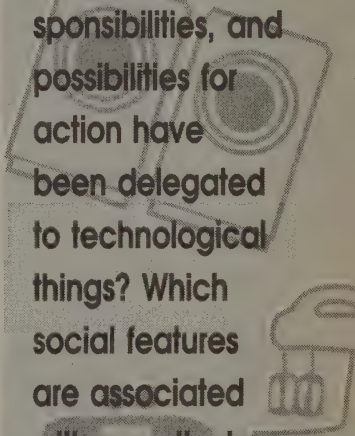
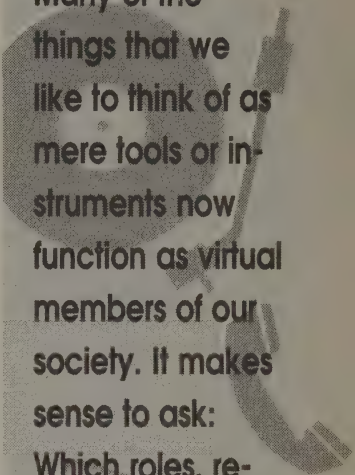
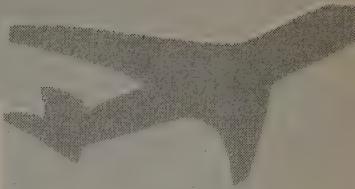
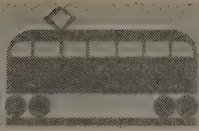
In the titles of a great many books, articles, and conferences these days, the topic is described as "technology and society" or "technology and culture" or "technology and politics." But if one takes a closer look, such distinctions no longer have much validity. In the late twentieth century, technology and society, technology and culture, technology and politics are by no means separate. They are closely woven together in a multiplicity of settings in which many forms of human living are dependent upon and shaped by technological devices and systems of various kinds. Our useful artifacts reflect who we are, what we aspire to be. At the same time, we mirror the technologies that surround us; to an increasing extent, social activities and human consciousness are technically mediated.

In this light, any attempt to understand the matter might well begin from either of two basic starting points: (1) the technological world seen from the point of view of human beings and (2) the same world seen from the point of view of the artifacts.



*Langdon Winner is a political theorist who specializes in social and political issues generated by modern technological change. He is the author of *Autonomous Technology and The Whale and the Reactor: A Search for Limits in an Age of High Technology* (both reviewed on p. 22).*

—Howard Rheingold



Although it may seem perverse to do so, I shall begin with the second perspective.

Many of the things that we like to think of as mere tools or instruments now function as virtual members of our society. It makes sense to ask: Which roles, responsibilities, and possibilities for action have been delegated to technological things? Which social features are associated with a particular artifact? For example, does a computer in the workplace function as servant, slave, controller, guard, supervisor?

The social roles delegated to the phone-answering machine provide a good illustration. It used to be that only executives in business and government could afford to keep a full-time secretary answering the phone, screening calls and taking messages. Now it is possible to buy a small, inexpensive answering machine that does at least some of that work. Alternatives would be to answer the phone yourself, have someone else do it for you, or simply miss some calls. The machine serves as a surrogate, a kind of nonhuman agent that has been given certain kinds of work to do.

An interesting fact about these machines is that their initial use often brings some embarrassment. In the little taped message that precedes the beep, there is often something like an apology: "I'm sorry I can't be here to answer your call . . ." or "I'm sorry you have to talk to this machine, but . . .". What one sees in cases like this is, I believe, quite common in modern life: the uneasy feeling that accompanies the renegotiation of social and moral boundaries around a technological change. But what is sometimes at first a source of discomfort eventually becomes a widely accepted pattern — second nature.

It is clear that in decades to come a great many things like telephone-answering machines and automatic bank tellers will become, in effect, members of our society. As their use spreads, the tone of embarrassment that surrounds their early introduction will gradually vanish. For better or worse, the renegotiation of boundaries will be complete. When I phoned a friend recently, I heard a recorded message that said simply: "It's 1991. You know what to do!"

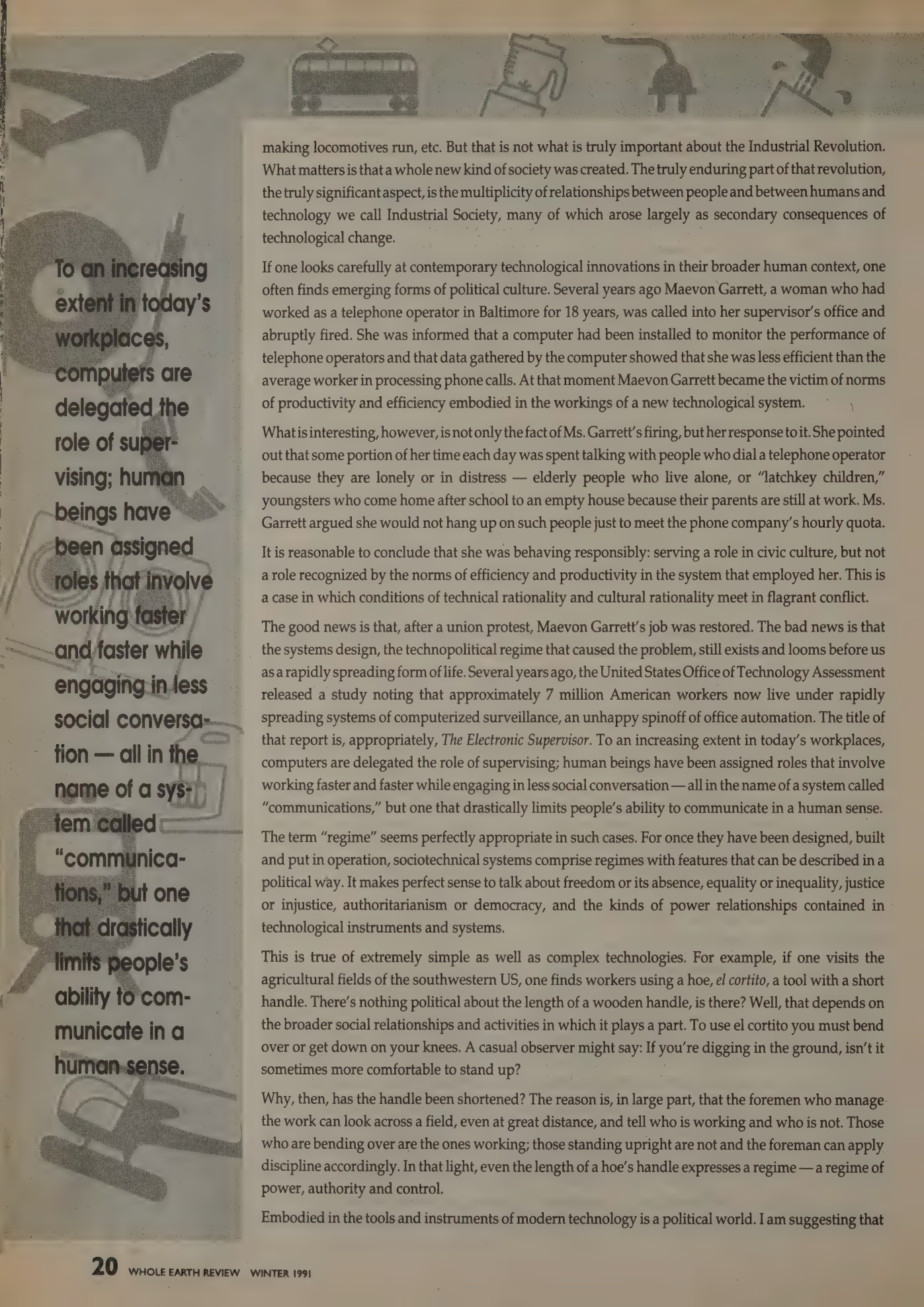
One can also consider technological innovations from the alternate viewpoint — noticing the roles, responsibilities, and possibilities for action delegated to human beings within and around technological systems of various kinds. Now one can ask: Is a person's guiding hand required for the system to function? Does the human give orders or receive them? Is the person active or acted upon? What social qualities accompany the human presence?

I will offer some illustrations in a moment. But first I want to call attention to the fact that once one has entered the twofold perspective I've suggested, one has the beginning of a social and political vision of technology quite different from the one that economists, engineers, and technology policymakers usually employ. One recognizes, first and foremost, that technologies are not merely tools that one picks up and uses. They can be seen as "forms of life" in which human and inanimate objects are linked in various kinds of relationships. The interesting question becomes: How can we describe and evaluate technologies seen as forms of life?

By comparison, in the conventional view of things, the story usually goes that people employ technologies as simple tools for rather specific instrumental purposes, to wrest new advantages over nature and to gain various economic benefits. Once these instrumental advantages and economic benefits have been obtained, other things may happen. There are secondary, tertiary, and more distant consequences of our actions, often called "impacts" or "unintended consequences": the broader social, cultural, political, and environmental effects of technological applications of various kinds.

For some purposes, it is perfectly acceptable to view technological change in the conventional manner. However, if you take a longer view of history, an interesting fact soon emerges. In the fullness of time, the "secondary" consequences of technological change are often far more significant than the results thought to be "primary" at the time. This is certainly true, for example, of the kinds of changes we associate with the Industrial Revolution. Thousands upon thousands of instrumental advantages and economic benefits were obtained during that period — techniques for making textiles, extracting coal,

Many of the things that we like to think of as mere tools or instruments now function as virtual members of our society. It makes sense to ask: Which roles, responsibilities, and possibilities for action have been delegated to technological things? Which social features are associated with a particular artifact? For example, does a computer in the workplace function as servant, slave, controller, guard, supervisor?



To an increasing extent in today's workplaces, computers are delegated the role of supervising; human beings have been assigned roles that involve working faster and faster while engaging in less social conversation — all in the name of a system called "communications," but one that drastically limits people's ability to communicate in a human sense.

making locomotives run, etc. But that is not what is truly important about the Industrial Revolution. What matters is that a whole new kind of society was created. The truly enduring part of that revolution, the truly significant aspect, is the multiplicity of relationships between people and between humans and technology we call Industrial Society, many of which arose largely as secondary consequences of technological change.

If one looks carefully at contemporary technological innovations in their broader human context, one often finds emerging forms of political culture. Several years ago Maevon Garrett, a woman who had worked as a telephone operator in Baltimore for 18 years, was called into her supervisor's office and abruptly fired. She was informed that a computer had been installed to monitor the performance of telephone operators and that data gathered by the computer showed that she was less efficient than the average worker in processing phone calls. At that moment Maevon Garrett became the victim of norms of productivity and efficiency embodied in the workings of a new technological system.

What is interesting, however, is not only the fact of Ms. Garrett's firing, but her response to it. She pointed out that some portion of her time each day was spent talking with people who dial a telephone operator because they are lonely or in distress — elderly people who live alone, or "latchkey children," youngsters who come home after school to an empty house because their parents are still at work. Ms. Garrett argued she would not hang up on such people just to meet the phone company's hourly quota.

It is reasonable to conclude that she was behaving responsibly: serving a role in civic culture, but not a role recognized by the norms of efficiency and productivity in the system that employed her. This is a case in which conditions of technical rationality and cultural rationality meet in flagrant conflict.

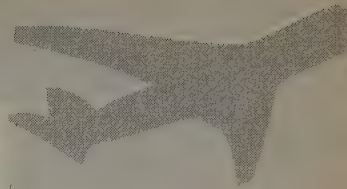
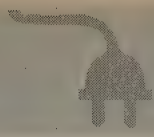
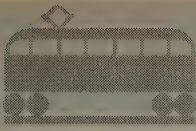
The good news is that, after a union protest, Maevon Garrett's job was restored. The bad news is that the systems design, the technopolitical regime that caused the problem, still exists and looms before us as a rapidly spreading form of life. Several years ago, the United States Office of Technology Assessment released a study noting that approximately 7 million American workers now live under rapidly spreading systems of computerized surveillance, an unhappy spinoff of office automation. The title of that report is, appropriately, *The Electronic Supervisor*. To an increasing extent in today's workplaces, computers are delegated the role of supervising; human beings have been assigned roles that involve working faster and faster while engaging in less social conversation — all in the name of a system called "communications," but one that drastically limits people's ability to communicate in a human sense.

The term "regime" seems perfectly appropriate in such cases. For once they have been designed, built and put in operation, sociotechnical systems comprise regimes with features that can be described in a political way. It makes perfect sense to talk about freedom or its absence, equality or inequality, justice or injustice, authoritarianism or democracy, and the kinds of power relationships contained in technological instruments and systems.

This is true of extremely simple as well as complex technologies. For example, if one visits the agricultural fields of the southwestern US, one finds workers using a hoe, *el cortito*, a tool with a short handle. There's nothing political about the length of a wooden handle, is there? Well, that depends on the broader social relationships and activities in which it plays a part. To use *el cortito* you must bend over or get down on your knees. A casual observer might say: If you're digging in the ground, isn't it sometimes more comfortable to stand up?

Why, then, has the handle been shortened? The reason is, in large part, that the foremen who manage the work can look across a field, even at great distance, and tell who is working and who is not. Those who are bending over are the ones working; those standing upright are not and the foreman can apply discipline accordingly. In that light, even the length of a hoe's handle expresses a regime — a regime of power, authority and control.

Embodied in the tools and instruments of modern technology is a political world. I am suggesting that



we use metaphors and rhetorical devices of political speech to unpack the meaning of various technologies for how we live.



EVERYONE UNDERSTANDS that political ideas can be expressed in language. But ideas of this kind present themselves in material objects as well. In this form they might be called artifact/ideas. In their silence, artifact/ideas have a great deal to say. They tell us who we are, where we are situated in the social order, what is normal, what is possible, what is excluded. The technological world is filled with artifact/ideas of great consequence for modern political culture. Things often speak louder than words. Among the many

ideas present in the structure of contemporary technological devices and systems are the following:

Power is centralized.

The few talk and the many listen.

There are barriers between social classes.

The world is hierarchically structured.

The good things are distributed unequally.

Women and men have different kinds of competence.

One's life is open to continual inspection.

As they are expressed in the shapes of material objects, ideas of this kind are covert.

They seldom become topics for discussion in the political sphere as it is usually understood.

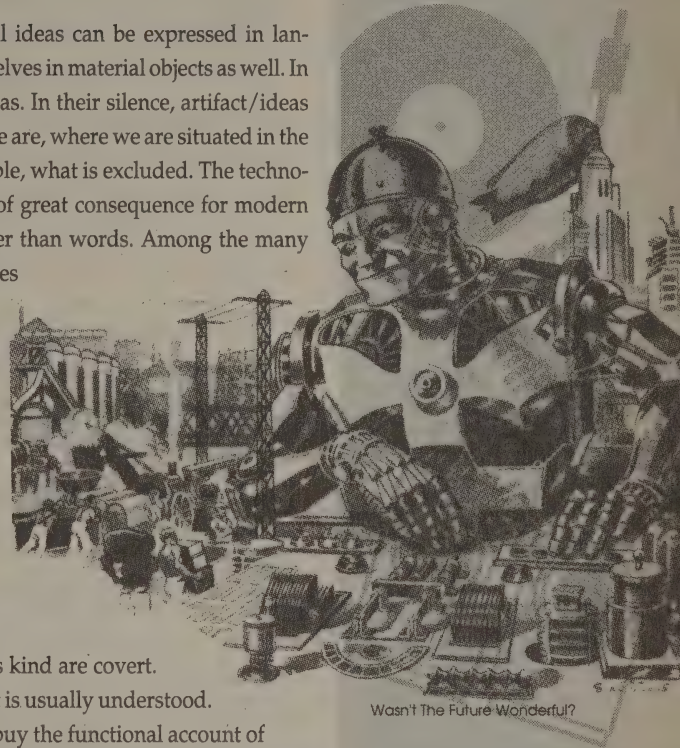
One reason that artifact/ideas tend to be covert is that most people buy the functional account of the meaning of material things. We are inclined to say: "This is a car, which enables us to go from point A to point B." "This is a hoe, which helps us to dig in the fields."

Another reason why ideologies in things tend to be covert is that they have been implanted there by those who do not wish the ideas to be known or widely discussed. The apparent solidity of useful things sometimes provides a mask for persons and groups who wish to exercise power while avoiding responsibility. Their alibi is usually something like: "This is the most effective way to do things" or "This is most efficient."

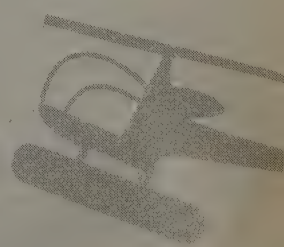
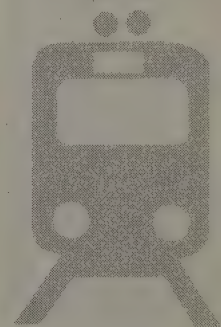
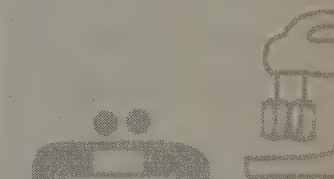
But whatever the source of specific beliefs and instrumental conditions, it is often true that ideas embodied in material things are painful or even dangerous to acknowledge. Artifact/ideas can involve astonishing contradictions. In particular, the mapping of the world encountered in the shape of things frequently contradicts the political ideology to which most people in Western societies claim to be committed.

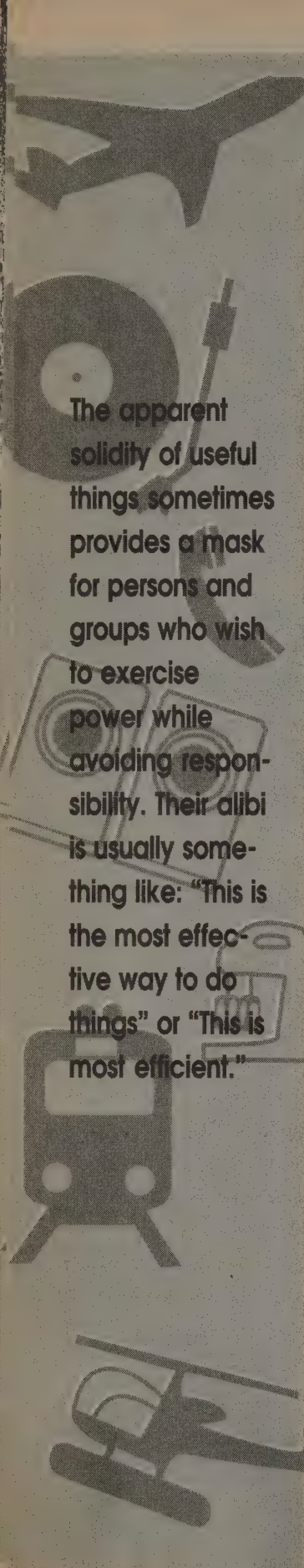
Many of the artifact/ideas prevalent in our time stand in flagrant contradiction to the ideology of modern democracy. That ideology holds that human beings flourish, achieving what is best in their potential, under conditions of freedom, equality, justice, and self-government. In that light, societies ought to create social conditions and political institutions that make it possible for each human being's potential to develop. Both victories and setbacks in this regard are clearly visible in the laws, constitutions, and political practices that prevail in each historical period.

From this vantage point, a technological society is unique only in the sense that it presents new and seemingly unlikely domains — domains of instrumentality — in which the ends of democratic freedom, equality and justice may somehow be recognized and realized. I take it to be the fundamental failure of modern civilization to have ignored again and again how such questions present themselves in the guise



Wasn't The Future Wonderful?





The apparent solidity of useful things sometimes provides a mask for persons and groups who wish to exercise power while avoiding responsibility. Their alibi is usually something like: "This is the most effective way to do things" or "This is most efficient."

of "neutral" technologies. To a considerable extent, the ideas embodied in material things stand in opposition to the central ideas that we believe describe and guide our political culture.

There is an important way in which freedom, democracy, and justice depend in human communities upon the existence of suitable material environments — the creation and maintenance of arrangements in which the goal of becoming free, self-determining individuals is nurtured rather than destroyed. As we look at the kinds of sociotechnical innovations being introduced today, it is often beside the point to ask whether or not they are optimally efficient; by someone's definition they are usually very efficient indeed. Instead, the crucial questions concern the kinds of cultural environments such technologies present to us. What one finds are far too many instances of developments of the following kind:

- (1) communications technologies employed in attempts to control people's thoughts, desires and behaviors;
- (2) computer technologies used to whittle away people's privacy and erode freedom;
- (3) information technologies that eliminate what were formerly places of community life;
- (4) energy systems that make people dependent upon, or even hostage to, sources of fuel over which they exercise no control;
- (5) systems of manufacturing that seek control by eliminating as much human initiative and creativity as possible.

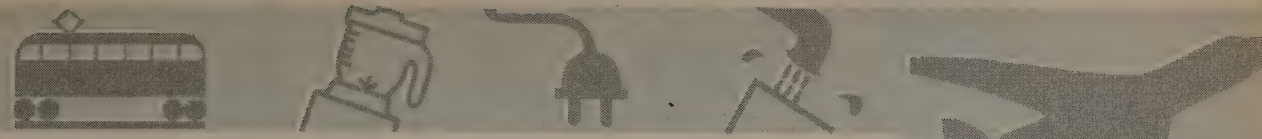
The appropriate moment to examine and debate conditions such as these is the time during which they are designed and first introduced into the fabric of human activity. At present our society persists in designing a great many technical artifacts in ways that make people feel passive, superfluous, stupid, and incapable of initiating action. Such systems bear the cultural embryos of tomorrow's citizenry. For as we invent new technical systems, we also invent the kinds of people who will use them and be affected by them. The structures and textures of future social and political life can be seen in the blueprints of technologies now on the drawing board.

We often hear these days that the world is engaged in a "technology race" in which nations rise or fall according to their ability to use technologies to competitive advantage. Unfortunately, some of the design strategies that look fabulous from the point of view of efficiency, productivity, and global competitiveness involve what amounts to an ingenious synthesis of feudalism and capitalism. Many people in freedom-loving countries like the United States seem eager to embrace repressive models of social integration expressed in automation, electronic surveillance and pseudodemocratic "quality circles." But must we embrace these emerging patterns of technofeudalism as the wave of the future? Would it not be a wiser approach to resist, choosing to explore ways of extending our ideas about freedom and a just society into the realm of technology itself?

Langdon Winner is one of the few writers to have tried to make sense out of the mass of writing on technology and its impact on all of us in recent years. These two books span a decade of his work, and provide an illuminating introduction to the field, marked throughout by a willingness to dismiss sloppy thinking and contemporary mythology.

***Autonomous Technology** is very much an academic work, a survey of the philosophy of technology with special attention to the notion that somehow the things we create are no longer under our control. **The Whale and the Reactor** is a more personal, more mature work that surveys a variety of themes including the political side of artifacts, the promise of computers, the hope of decentralization and the shaky legacy of the appropriate-technology movement. Winner does not offer any easy solutions or put his faith in a revolution in human thinking. Instead, he clearly lays out some of the dimensions of our current peril and suggests lines of inquiry and action which, though hard, offer some real hope of leading to change.* —Mike Gunderloy

• The concern of science and technology with the possibilities of control have often found expression in terms which closely parallel the language of politics. This is perhaps not surprising if one recalls that both politics and technics have as their central focus the sources and exercise of



One obvious path that may still be open to us is to cultivate ways of democratizing the process of technology policymaking and, indeed, the process of technological innovation. If this is to be done, both citizens and experts will need to become aware of the social, moral, and political dimensions of choices made in technological policy and technological design. They will need to find ways to act directly and democratically within settings in which the important choices are made.

In that light I would offer three guiding maxims as a way to focus discussions about the relationship between technological choices and the future of political culture. These maxims can be raised at times in which unquestioned assumptions about "productivity," "competitiveness," "the need to innovate," or "technology transfer" seem to provide the only language for talking about the choices at hand.

1. *No innovation without representation.* This suggests that all the groups and social interests likely to be affected by a particular kind of technological change ought to be represented at a very early stage in defining what that technology will be. Let us accept the idea that particular technologies are social creations that arise through a complex, multicentered process. But let us see to it that all the relevant parties are included, rather than kept in the dark about this process. If we find that we do not have the kinds of social institutions that make this possible, then let's change our institutions to

Autonomous Technology • The Whale and the Reactor

power. Our thinking about technology, however, seems inextricably bound to a single conception of the manner in which power is used — the style of absolute mastery, the despotic, one-way control of the master over the slave.

- In most modern technological systems autonomous action is truly available to the center alone. Some have argued that peripheral parts also exercise a measure of control by selecting which information actually reaches the center. A few varieties of highly technical organization, think tanks like RAND for example, have found that attempts at central coordination are more of a hindrance than help in getting work done. Taking such paltry signs as a cue, some observers have begun to predict that a collegial decentralization is the wave of the future. But compared to the success of central control in likes of the Apollo program or the worldwide operations of ITT under Harold Geneen, the alleged counterexamples are pathetic.

- In the vogue for "reading dynamics," for example, we see one instance in which the combined emphasis upon speed and efficiency — increased words per minute plus increased comprehension — reduces an activity with many possible values to a pure instrumentality. Slow reading, for example, can often be a marvelous occasion for thoughtful reflection. Nietzsche believed this and advised that readers take a walk to ponder the things that they found insight-

ful in books. But Nietzsche was not Evelyn Wood. He did not know that the primary end of reading is not insight or illumination but merely the maximum information crammed in per minute expended.

—*Autonomous Technology*

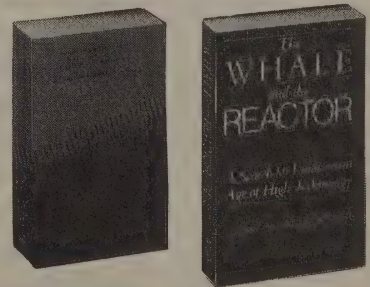
- A crucial failure in modern political thought and political practice has been an inability or unwillingness even to begin the project I am suggesting here: the critical evaluation and control of our society's technical constitution.

- Taken as a whole, beliefs of this kind constitute what I would call mythinformation: the almost religious conviction that a widespread adoption of computers and communications systems along with easy access to electronic information will automatically produce a better world for human living. It is a peculiar form of enthusiasm that characterizes social fashions of the latter decades of the twentieth century. Many people who have grown cynical or discouraged about other aspects of social life are completely enthralled by the supposed redemptive qualities of computers and telecommunications.

- Often held up as a source of illumination on the most difficult questions and choices, the concept of "values" is better seen as a symptom of deep-seated confusion, an inability to think and talk precisely about the most basic questions of human well-being and the future of our planet.

- More and more the whole language used to talk about technology and social policy — the language of "risks," "impacts," and "trade-offs" — smacks of betrayal. The excruciating subtleties of measurement and modeling mask embarrassing shortcomings in human judgment. We have become careful with numbers, callous with everything else. Our methodological rigor is becoming spiritual rigor mortis.

—*The Whale and the Reactor*



Autonomous Technology

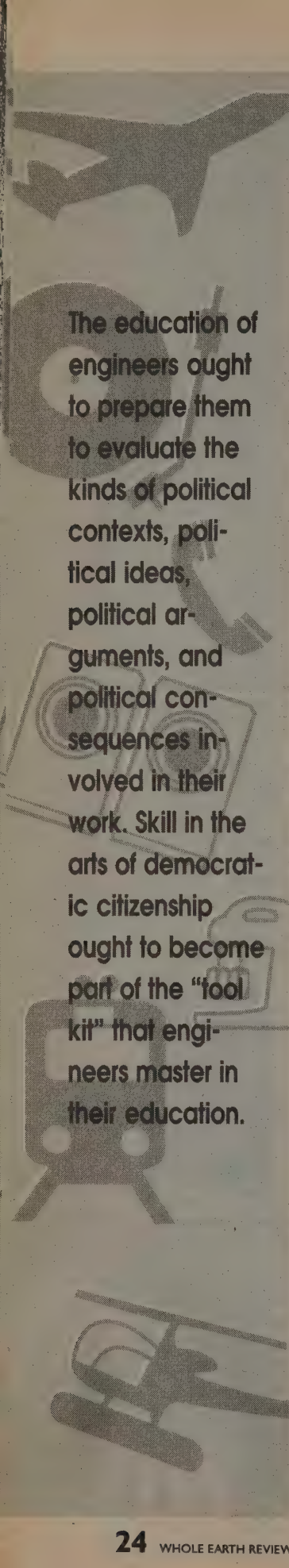
Langdon Winner, 1977; 386 pp.

\$12.95 (\$15.95 postpaid) from The MIT Press, 55 Hayward Street, Cambridge, MA 02142; 800/356-0343 (or Whole Earth Access)

The Whale and the Reactor

Langdon Winner, 1988; 200 pp.

\$8.95 (\$10.95 postpaid) from The University of Chicago Press, 11030 S. Langley Avenue, Chicago, IL 60628; 800/621-2736 (or Whole Earth Access)



The education of engineers ought to prepare them to evaluate the kinds of political contexts, political ideas, political arguments, and political consequences involved in their work. Skill in the arts of democratic citizenship ought to become part of the "tool kit" that engineers master in their education.

create such opportunities.

2. *No engineering without political deliberation.* Proposed technological projects should be closely examined to reveal the covert political conditions and artifact/ideas their making would entail. This ought to become an interpretive skill of people in all modern societies. It is especially important for engineers and technical professionals whose wonderful creativity is often accompanied by appalling narrowmindedness. The education of engineers ought to prepare them to evaluate the kinds of political contexts, political ideas, political arguments, and political consequences involved in their work. Skill in the arts of democratic citizenship ought to become part of the "tool kit" that engineers master in their education.

3. *No means without ends.* Many of the varieties of innovation pushed on the public these days amount to tools looking for uses, means looking for ends. Those who have dealt with the introduction of computers into the schools in recent years can give many colorful examples of this phenomenon. The current promotion of high-definition television and renewed efforts to push President Reagan's Star Wars project offer even more stark illustration. For HDTV and SDI bear little relationship to any significant human need. As we study the prospects offered by new technologies, it is always essential to ask: Why are we doing this? What are the ends we have chosen and how well do they fit the pattern of means available? In many cases of high-tech planning, suitable background music would be the theme from "Twilight Zone."

If you want examples of places in which principles similar to these three maxims are actually being put to work, I would point to some recent experiments in the Scandinavian democracies, where a positive, creative politics of technology has recently become a focus of research and development. In one such project, workers in the Swedish newspaper industry — printers, typographers, lithographers, and the like — joined with representatives from management and with university computer scientists to design a new system of computerized graphics used in newspaper layout and typesetting. The name of the project was UTOPIA, a Swedish acronym that means "training, technology and products from a skilled worker's perspective."

UTOPIA's goal was to fashion a system that would be highly advanced technically, but designed in ways that would take into account the skills, needs, and perspectives of those who would eventually be using it. Rather than develop a system under management directives and then impose it on workers, the project included representation of the people concerned. UTOPIA became the focus of a rigorous program of research and development at a government-sponsored laboratory, The Center for Working Life in Stockholm. Here was a case in which the purely instrumental and economic thrust of technological innovation encountered a legitimate set of political ends and enlightened artifact/ideas. The result was democratization expressed in hardware, software, and human relationships.

The technological world of the twenty-first century beckons. Will it be better than the one we now inhabit, or worse? Will it realize the promise of human freedom, or curtail it? And whose interests will be decisive?

If ordinary citizens are to be empowered in shaping the world to come, we must become very skillful in areas where we are now profoundly ignorant: using ideas and abilities that enable us to define and realize human freedom and social justice within the realm of technology itself: within things like new machines for the workplace, computerized systems of information management, biotechnologies in agriculture and medicine, communications devices introduced into our homes. If we cannot develop these skills, or do not care to; if we fail to confront the world-shaping powers that new technologies present; then human freedom and dignity could well become obsolete remnants of a bygone era. ☺

Averting Catastrophe

Considering the variety of technological threats to which we are subjected — nuclear power, gene-splicing, synthetic pesticides, ozone depletion and the greenhouse effect, to name a few — it is sometimes surprising that anything is still alive on the planet at all. Morone and Woodhouse analyze this situation and tease out a series of heuristic strategies, which are already in use to help protect us from new technologies, and which go beyond the simple trial-and-error most political theorists see operating in society. For example, as rDNA experimentation got underway, there was a deliberate attempt to protect against possible hazards through containment, to estimate the risks conservatively, and to reduce the uncertainty by directing research toward establishing just what these risks were. Although they see our relative safety as no accident, the authors go on to argue for their more systematic and conscious application as we move into increasingly risky realms of technological action. One remaining serious problem is that the ensemble of available strategies is at its weakest when confronted with problems featuring high uncertainty and long lag times for effects to be known — such as our current problems with the ozone layer. —Mike Gunderloy

At the outset of this research, we approached this subject with the commonly held assumption that the United States had botched the job of regulating risky technologies. Yet when we actually delved into how regulators have coped with the various risks, we discovered a surprisingly intelligent process. That is not to say the outcomes are fully satisfactory; but the strategies are far more sensible than we expected. The strategies we found usually were not fully developed. Nor were they always implemented effectively. And, in most of our cases, some useful strategies were ignored or underemphasized. But taken together, the strategies we found in use suggest the elements of a complete system for averting catastrophe.

How does the objective nature of a technology relate to the widely accepted view that public perceptions and fears are what really guide technology debates and shape policy? We believe that the nature of a social problem limits what constitutes legitimate debate. The nature of the problem in the nuclear power debate is such that there is no way to establish definitively the magnitude of the risks. Advocates of nuclear power can insist that the probabilities of accidents are very low, that the major causes of accidents have been anticipated, and that the worst case would not really be that bad, but none of these arguments can be fully verified. Regulators are left with no conclusive basis for deciding between these claims and opposite claims.

Lacking a basis for resolving the facts of the matter, factors like public perceptions and general attitudes become important. The position one takes on the conflicting estimates of the risks depends on whether one trusts government institutions, whether one fears high technology, and so on.

In contrast, the nature of the rDNA problem imposed objective constraints on the resulting debate. Once studies demonstrated that *E. coli* K-12 was highly unlikely to survive outside the lab and cause epidemics, the credibility of counterclaims about high risks diminished. The burden then shifted to the opposition to provide evidence, based on experience or experiments, that the risks were in fact as great as claimed. In other words, the facts constrained the debate. Such "facts," determined at any given time by scientific

Averting Catastrophe

Joseph G. Morone and Edward J. Woodhouse, 1986; 224 pp.

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consensus, may later prove to be mistaken; until that time, they restrict the range of legitimate disagreement. And they constrain the currency of the debate as well, since only new "facts" are sufficient to displace old ones.

The Fail-Safe Society

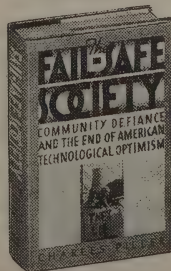
NIMBY — Not In My Back Yard — is the name for a democratic, grassroots, and often vexing social movement. As a society, people in America don't seem to be attacking technological progress; at least they seldom do it effectively. As neighborhoods, people seem able to halt the construction of everything from nuclear plants to hospices. Many believe that local opposition to scientific or technological enterprises is leading to a kind of social paralysis. As a society, we need major airports, hazardous-waste disposal sites, medical research centers, AIDS halfway houses. Charles Piller started out as a writer with attitudes like those I had as a reader: that NIMBY is another symptom of the tragedy of the commons, and one of the forces that is leading to social breakdown; that uninformed opposition to technology has the potential for causing more misery than a well-managed technological facility. When he began to study the spectrum of community opposition, Piller changed his mind. He has changed mine, too. —Howard Rheingold

Conventional wisdom, as promoted by those who introduce, manage, or profit from science and technology, holds that

The Fail-Safe Society

Charles Piller, 1991; 272 pp.

\$20 (\$22.75 postpaid) from Harper-Collins Publishers/Direct Mail, P. O. Box 588, Dunmore, PA 18512; 800/331-3761 (or Whole Earth Access)



Nimbyism is the product of selfish ignorance about risk and that Nimby groups should be stamped out before they irreparably harm our ability to extend society's technical reach and advance our standard of living. When I began this book, in a basic way I agreed with this view. I saw Nimbyism as a vexing problem to be solved. In individual cases, of course, a Nimby response is certainly understandable or justifiable — even noble. But as a trend, I reasoned, Nimbyism is poison for a society that aspires to democratic processes and social cooperation. I saw this as the central question of the book: How can Nimbyism be eliminated without sacrificing legitimate aspirations for local control and personal safety? . . .

I grew to recognize that by labeling Nimbyism as the problem I had obscured more central issues. It is not risk per se, but how hazards have been generated and distributed that has led to the Nimby era. In a society that boasts a strong democratic identity, the demand for local participation in technological decision making is hardly surprising, even if the degree of outrage over inept technological choices has startled scientists and technology's managers. (Ironically, democratic aspirations derive partly from the scientific culture itself, with its commitment to open communication and diverse participation in the definition of natural laws.)

What does the prevalence of Nimbyism tell us about the way science and technology are administered in our society? The similarity of the Nimby response across educational and income levels, racial and geographic lines, points away from ignorance and selfishness as the roots of Nimbyism. It suggests a more fundamental cause — the dominance of an autocratic, profligate, and often irresponsible system for managing the scientific and technological enterprise. Communities all over the country, in anger and despair, have mounted organizational barricades around their backyards. They have adopted Nimbyism as the only practical alternative to powerlessness.



Assessing the Impacts of Technology

BY D. LINDA GARCIA



NEW TECHNOLOGIES are rarely viewed from a position of neutrality. Instead, they are seen as being either the means of mankind's salvation or the cause of its demise. Consider the telegraph. With its power to overcome distance, and hence time, some saw the telegraph as a form of universal communication that would "bind together all the nations of the Earth, link men by a single mind, and give preponderance of power to the nations representing the highest elements of humanity." In contrast, others predicted that the telegraph would lead to cultural decline. As one social observer of the time noted, with news traveling so rapidly via telegraph and being so readily available, the individual would be "entertained with the swindler, the vices and the crimes of the Earth; his paper [would immerse] him in all sorts of things and can only cease to pain him by hardening his heart and taking off the edge of his conscience." *

Linda Garcia is a project director and senior analyst at the Office of Technology Assessment, a research arm of the US Congress. In her fifteen years at OTA, she has worked on assessments having to do with transportation, radioactive waste, and acid rain. As a member of the Telecommunications and Computer Technologies Program, she has worked in the areas of information technology and education, human resources for information-technology R&D, and information policy. She served as project director for the OTA assessments Intellectual Property Rights in an Age of Electronics and Information; Critical Connections: Communication for the Future; and the recently released Rural America at the Crossroads: Networking for the Future.
—Howard Rheingold

With the debate thus cast between technophiles and Luddites, there is little room for a middle ground. Both sides are heavily armed. Each can draw on any number of examples to substantiate its position. But the problem of understanding technology remains unresolved in the heat of the argument; few stop to sort out, or even to consider, the circumstances under which technology can work for or against society. It is this kind of assessment that policymakers must have if they are to make sound decisions about technology development and deployment.

The Office of Technology Assessment undertakes such assessments. OTA is a research arm of the Congress, much like the Congressional Research Service, the General Accounting Office, and the Congressional Budget Office. To distinguish OTA from its sister agencies, and to understand its mission, one needs to look at its history, and the circumstances under which it came to life.

OTA was created in 1972, with the passage of the Technology Assessment Act. This was a time of considerable domestic turmoil; there was growing disillusionment with many es-

tablished institutions, public and private. Part of this disillusionment grew from our problems in Vietnam; but it also reflected our growing awareness of some negative aspects of technology. During the early sixties, Rachel Carson had published *Silent Spring*, describing the harmful effects of DDT. And in the mid-sixties, Ralph Nader had first told Americans that their cars were unsafe.

We also discovered that technological impacts might be extended and experienced over time and space. We learned, for example, that to understand the consequences of using DDT, we would have to trace its effects through more than one generation of the plants and animals with which it had come into contact. And we found that sulfur dioxide, even if it were generated by coal-fired utility plants in our Midwest, could travel as far as Canada, and, in the process, be transformed into acid rain.

Given this growing number of technological issues, and an increased awareness of their complexity, Congress decided that it needed more and better information about how new technologies might affect society. Rather than relying on other institutions to provide this information, Congress wanted its own source of information, independent of the executive and judicial branches of government.

* Daniel Czitrom, *Media and the American Mind* (Chapel Hill, NC: The University of North Carolina Press, 1989).



OTA was created to look at the long-term impact of technology on society. This does not mean that we were to take a position on technology. Rather, we were to try to anticipate technological consequences, so that we might avoid or ameliorate the negative impacts while still enjoying the benefits.

OTA's success has been in its ability to balance the political and the analytical. OTA has carried out objective research and analysis of a number of controversial subjects while operating in the highly politicized congressional arena. Being able to operate simultaneously in both the political and research arenas means that our studies are generally relevant to the issues at hand, and that they are likely to have an important policy impact.

Speaking about my own particular program at OTA, the Telecommunications and Computer Technology Program, I can point to a number of recent cases where our studies have significantly affected the outcome of the congressional debate. The policy conclusions from our study on electronic surveillance were used as the basis of a new privacy law. And our study concerning the impact of technology on intellectual property rights broadened and fundamentally restructured the national discussion of the issues.

Because the US political system is based on the separation of powers, there is room for OTA to play a truly independent (albeit political) role. Under this system, where there are a number of "independent commissions" staffed by the executive branch but accountable to Congress, OTA is a thoroughly legitimate and acceptable way of organizing policy research.

OTA's organizational structure helps it to maintain this delicate balance between research and politics. OTA is, first of all, a nonpartisan agency. It is governed by the Technology Assessment Board, a bipartisan, bicameral body made up of six members from both the House and the Senate, who represent both parties equally. This board rules on and approves OTA studies at their outset and at their conclusion.

Unlike the Congressional Research Service, which responds to requests from individual congressmen, OTA works only for committees, which are themselves bipartisan. Typically a requesting committee will ask us to do

a study. The appropriate program within OTA will then develop a proposal which, after internal review, will be submitted to the Technology Assessment Board for approval. The board will also review the final draft of the report; upon approval by the board, a study's findings are released to the public.

OTA's research method reflects its unique role. Many federal agencies seek information and get feedback by holding hearings, calling for comments in the *Federal Register*, and undertaking inquiries. The information thus generated is then collated and synthesized in government reports. Presumably the sum of these public comments equals the "public interest." In my view, this does not constitute research; it is, instead, a literary form of log-rolling. At OTA, we begin by conceptualizing the problem, setting up hypotheses, and developing research questions. This is a more rigorous and objective approach.

This is not to say that we try to avoid outside opinion. We make an effort to seek a representative balance of all points of view. By reaching out to all the players, and incorporating their concerns into our research design and analysis, we create a product that is valued as much for its process as for its substance.

All OTA assessments are supported by an advisory panel, comprising individuals who are knowledgeable in a particular area, or who have a stake in a study's outcome. The panel's job is to provide OTA staff with advice about the scope, methodology, and substance of a study. Members come from business, academia, public-interest groups, and sometimes from the general public. Putting together a good panel, whose members will work well together, is akin to designing a work of art. A balance needs to be struck, not only among interests but also among personalities.

OTA advisory panels take on a life of their own. Panel members rarely agree, either with OTA or among themselves. They debate and argue using OTA draft documents as the basis for discussion. In the process, panel members inform OTA as well as each other.



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effort to seek a representative balance of all points of view. By reaching out to all the players, and incorporating their concerns into our research design and analysis, we create a product that is valued as much for its process as for its substance.



The OTA staff's research also benefits from the help of experts. Contractors generally write background papers on subjects that are outside the scope of the staff's expertise. When faced with a unique or particularly thorny research problem, the staff might put together a workshop where experts can come together to discuss the data and sort out the evidence.

Interested parties also come to speak to us, and their input is always welcome. In fact, I often invite people to "lobby" us. A lobbyist's statement can be turned into a hypothesis: "If Government would only do . . . , then . . . would happen." This is a perfect "if/then" statement, and an excellent source of research questions.

OTA studies also reach out to the public. For

example, as part of our study *Intellectual Property Rights in an Age of Electronics and Information*, we conducted a number of focus groups and a public-opinion survey to gain a better understanding of the ethics involved in copying. Since young people are major users of electronic products, we also held a workshop of junior-high and high-school students. We wanted to find out what the general public considered to be "fair." This was a critical piece of information for us. We could not suggest changes in intellectual property laws unless we had a good idea of how enforceable they might be.

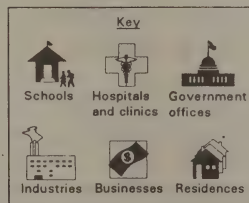
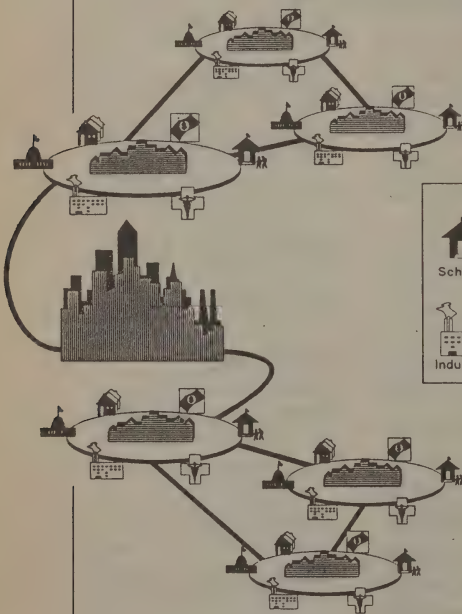
Our recent study *Rural America at the Crossroads: Networking for the Future* took us out into the field. We did not believe we could study rural development without trying to

Rural America at the Crossroads

Linda Garcia was the project director of OTA's recent assessment of the impact of communication technologies on rural America. This document lays out the options available to citizens and policy-makers today, and forecasts the possible future impacts of current decisions. Ten years from now, it might be useful to look back at this. —Howard Rheingold

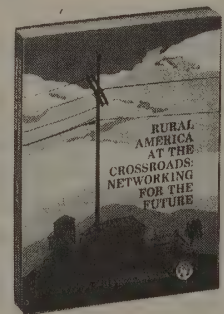
of intervention, these communities are headed for decline.

Advanced communication and information technologies are certainly not "the" solution to the many problems confronting rural America. In fact, one needs only to look historically to see examples where the deployment of these technologies has left rural communities worse off. However, in the current economic environment, in which businesses are using these technologies strategically to gain a competitive advantage, communities and businesses that have limited access to them are unlikely to survive. While not a panacea, in a global, information-based economy, these technologies could help rural communities overcome a number of the barriers that have limited their economic well-being in the past.



A Rural Area Network would be designed to foster the deployment of advanced technology to rural areas in an economically viable manner by pooling the communication needs of a community's many users — especially the businesses, educational institutions, health providers, and local government offices.

Although often isolated and remote, America's rural communities do not exist in a vacuum. They will inevitably change as the world around them changes. As communication technologies extend rural ties and expand rural markets, these communities will become increasingly vulnerable to national and global trends and events. For rural America, the most critical of these developments will be the adjustment to a highly competitive, service-based, global economy and the emergence of major, worldwide environmental concerns that will compel them to reorient their economies. Since many rural communities lack essential financial and human resources, and often depend on a single industry for the lion's share of their wealth and vitality, their ability to adapt to these changes is limited. Without some form



Rural America at the Crossroads

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\$9.50 postpaid from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325; 202/783-3238



understand the people, their cultures, their environment, their problems, and their hopes and aspirations. And we knew we had to visit more than one place. Although rural communities share a number of values, the way these values enter their social and political discourse varies greatly. For this reason, we chose to visit four states: Kentucky, New Mexico, Washington, and Maine. We selected them for geographic balance, ethnic and economic diversity, and contrasting approaches to the development of the telecommunications infrastructure. In each state, we visited economic-development professionals, telephone-company representatives, politicians and activists, educators and academics, businesspeople, and "ordinary" citizens. With the four members of our project staff traveling together for a week at a time, processing our experiences as we went along, continually debating our findings, we were able to develop a new way of thinking about telecommunications and rural economic development.

Our record of success does not assure our future. As a maturing government agency, OTA faces a number of challenges. Although we have survived for a number of years, we need to develop and maintain a broad-based national constituency that strongly supports what we do. In effect, we need to rekindle the spirit that gave us our beginning. This will be hard to do in a policy environment in which the major preoccupations are international competitiveness and a balanced budget. It is not only difficult to raise controversial issues in such an environment; it also requires being able to justify costs in terms of some demonstrable benefit. And quantifying in advance the benefits of correctly anticipating technological impacts — especially when they are negative — is a difficult task indeed.

A second problem stems from the fractionated nature of our government. Technology assessment strives to be holistic, to bring together a wide assortment of interrelated issues. Yet in a country where power is divided among a number of agencies and institutions, there is no single locus where problems can be dealt with comprehensively. Even in Congress, issues are broken up on a committee-by-committee basis. And concerns about turf, more often than not, preclude real cooperative joint action.

This problem is nowhere exhibited more clearly than in the area of communication policy. In the United States, responsibility for communication policy is highly fragmented. A number of agencies have a say in such matters, including the National Telecommunication and Information Administration (housed in the executive branch within the Department of Commerce), the FCC (an independent agency responsible to Congress), the Department of Justice, Judge Greene and the 1st Circuit Court of the District of Columbia (responsible for administering the Modified Final Judgment that broke up the Bell telephone system into the Regional Bell Operating Companies), the National Institute for Standards and Technology, the Department of State, and the House and Senate Commerce Committees together with their respective telecommunications subcommittees. In this environment, it is no wonder that we have been unable to establish any communication policy, much less a holistic one. Thus, when OTA recently completed a broad-based study on communication policy examining a wide range of interconnected communication issues, there was no place where it could be "received" in the comprehensive fashion in which it was written.

Political divisiveness, and its tendency to constrict how policy issues are conceived, can only increase in the future, as we take further steps to balance the budget. With the pie shrinking, everyone begins to clamor for his or her "fair share." And there will be more money and resources for those who succeed in defining issues narrowly.

If technology assessment is to continue to play an important policy role, it needs to develop further as a discipline. For this to happen, everyone needs to be part of the debate. And the discussion needs to be more sophisticated. We need to spend more effort trying to understand the dynamics of technology as it evolves in different social contexts, and less time promoting or denouncing technology itself. Hopefully, discussions such as the one appearing in these pages will further this effort. ☛



TECHNOLOGY

assessment strives to be holistic, to bring together a wide assortment of interrelated issues. Yet in a country where power is divided among a number of agencies and institutions, there is no single locus where problems can be dealt with comprehensively.



RENEGOTIATING SCIENCE'S CONTRACT

BY HOWARD LEVINE

WHILE no one realized it at the time, it now seems clear that Neil Armstrong's "one small step for [a] man" was also the symbolic top step for the public's perception of science and technology. What has happened to science, the putative religion of twentieth-century *Homo sapiens*? How did it fall from grace so quickly?

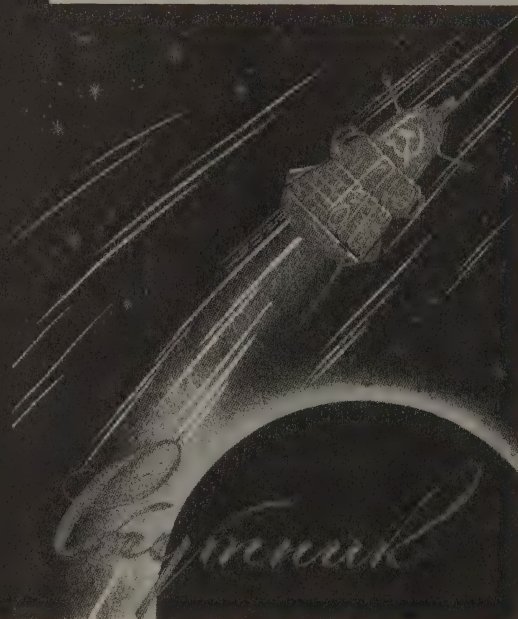
Howard Levine, unemployed philosopher, is former director of the National Science Foundation's Public Understanding of Science Program. He is the coauthor (with Howard Rheingold) of *Talking Tech* (William Morrow, 1983) and *The Cognitive Connection* (Prentice-Hall, 1986), and the author of *Life Choices* (Simon & Schuster, 1987).
—Howard Rheingold

THE OLD CONTRACT

Support for science and technology in the larger society derives from two sorts of beliefs: first, that those intellectual endeavors contribute to the material wellbeing of society; second, that science has intrinsic value in terms of the rational, empirical search after truth for its own sake. During the years immediately after World War II, almost no one was calling these beliefs into question.

In retrospect, science in the 1950s seems dominated by one event — the launching of *Sputnik*. Given the Cold War and fear of the use of space for military purposes, it was natural to be concerned about the threat of Russian space supremacy. In addition to national defense, scientific advancement, through the space race, became an important political tool. It was crucial that the USA and not the USSR be perceived by the rest of the world as the dominant space power.

Another important fact about the space race was its unintrusiveness; it simply did not affect the everyday lives of the general populace. People cared about the success or failure of a space shot because of what it symbolized — national pride and technological preeminence — not because it directly affected their lives. Supporting science and the space program was simply a function of good citizenship.





A third important fact in establishing the social climate for science and technology in the 1950s was NASA's brilliantly orchestrated publicity campaign. Given its series of successes, solid congressional support, informational programs for both children and adults, and judicious use of television, it is not surprising that the general public had an overwhelmingly positive view of science. In fact, this public perception was nearly unanimous. A University of Michigan study published in 1958 showed that only 3 percent of the sample asked disagreed with the statement that "Science is making our lives healthier, easier, and more comfortable." Only 6 percent disagreed with the statement that "One of the best things about science is that it is the main reason for our rapid progress." Perhaps General Electric was poll-watching when it coined the slogan, "Progress is our most important product." Questions about the undesirable side effects of "progress" would not become popular until well after the publication of Rachel Carson's *Silent Spring* (1962).

Given the public's positive and benign view of science and technology in the 1950s, it is not surprising that the implied social contract, or bargain, between science and the larger society was modeled very much on *laissez-faire* principles. According to Gerald Holton, professor of physics and the history of science at Harvard University, the bargain between science and society involved a form of barter. Society expected to receive material benefits in exchange for granting scientists moderate

financial support and considerable administrative freedom. Under the conditions of the implied contract, the two parties were distant and disengaged. Each relinquished to the other things that it could well afford to yield or that it did not particularly treasure. Yet the public perception of science was about to change and, along with it, a desire to renegotiate the terms of the contract began to arise.

RENEGOTIATION

In every age, the status of science is linked directly to the other interests and institutions of the larger society. There have been periods (e.g., between the two world wars) when that relationship has been stable and the role of science clear. However, there have also been periods such as the early seventeenth century — where the conflict between science and society is best exemplified by the persecution of Galileo — when the role of science has been in dispute. It seems that America is currently in just such a dispute over the value of science in our society. It is not necessarily a loss of confidence in scientists or a decline in the belief that science and technology can help solve many of our problems. It is fundamentally a dispute about how much influence sci-tech should have on our lives and who should be making the decisions governing the extent of that influence.

There is no single reason behind the public's desire to have a greater voice in sci-tech policy formulation. Nor can "the public" be regarded as monolithic either in its concern over particular issues or in its response to each such issue. However, there does seem to be a cluster of five reasons that, taken together, explain the greater part of the public's desire to renegotiate science's contract:

1. *Intrusive Technology* — Whether it's societal anxiety over large-scale, centrally controlled technologies (e.g., nuclear power) or personal concern regarding the nonavailability of desired drugs (e.g., RU486), technology plays a fundamental role in everyone's life. Far from being a test of good citizenship, support for science and technology in the 1990s is usually determined by personal, social, economic, and political considerations.

2. *Undesirable Research* — Although recombinant DNA research receives the



Scientists & Inventors

Sci-tech policy, Inquisition style: Galileo was tried for heresy in 1633 for insisting that the Sun, rather than the Earth, was the center of the universe.



lion's share of the headlines from both those who oppose it on safety grounds (means) and those who oppose it on ethical grounds (ends), many areas of scientific research and practice are undergoing close scrutiny. For example, the growing body of guidelines governing the conduct of experiments regarding animals and human beings, regulation of data-collection activities, concerns about the use of science to excite racial, sexual, or class prejudices, and concern that scientific investigations involving fetal research may have profound moral and ethical implications. Even when safety is not a consideration, the public is beginning to view many areas of scientific research as a Faustian bargain.

3. *The Knowledge Elite* — As scientific and technical knowledge have assumed growing policy importance, so has the decision-making power of independent, specialized bureaucracies such as the Nuclear Regulatory Commission, the White House's Office of Science and Technology Policy, and Congress's Office of Technology Assessment. This use of a "knowledge elite" has tended to insulate sci-tech policymaking from public

control. Thus, while sci-tech choices have increasing social impacts, traditional political outlets for consensual decisionmaking play a decreasing role in fostering those policies.

4. *Public Science/Scientists* — There are more scientists alive today than the total number of deceased scientists, and they are not all practicing esoteric, lab-coat science. Many scientists, at organizations such as The Center for Science in the Public Interest or The Union of Concerned Scientists, are concerned with policy issues that have ethical, economic, social, and political components. Yet, as scientists have become advocates, they have surrendered some of their authority derived from the time-honored neutral pursuit of knowledge governed only by the rigors of method. While it is both legitimate and useful for scientists to investigate problems with social implications and to present their own views in light of the evidence gathered, they must realize that this is a role change with severe consequences: closer public scrutiny of methods used for evidence of bias in favor of results obtained. This may be an old political problem, but it is a relatively new one for science and scientists.

5. *Big Science* — In 1989, the US spent \$132 billion on research and development — about half by government, half by industry. With so much money at stake, the public simply wants to make sure that it is getting what it's paying for. The growing interest in the direction of some funding decisions — AIDS vs. other biomedical research, a few "mega"-projects, supercollider and human-genome vs. more and smaller projects, defense vs. non-defense spending, and the continued investigations into the peer-review system — provides evidence that the public is no longer sure that scientists and engineers acting alone are the best judges of the most promising areas of scientific and technological activity.

These five reasons are not merely abstractions. They represent real trends as the contract between science and the larger society undergoes its renegotiation. Yet, while it is still too early to envision the completed contract, some of its major clauses are already discernible.



Scientists & Inventors

In cases such as the storing of nuclear wastes, certain population groups are asked to bear a substantial risk so that other sectors of society, often in a different political jurisdiction, may benefit.

THE NEW CONTRACT

One major clause in the new contract involves responsibility for determining the risk-benefit calculus to be used in cases of technological applications. While it is clear that citizens expect their government to protect them from the potentially reckless decisions of individual entrepreneurs (not to mention the government itself), just how much authority the citizenry is willing to grant to the government is less clear. A major issue in this regard is the extent to which the federal government should issue "uniformity-of-standards decrees" setting maximum and minimum levels of safety which would be binding on state and local governments. It may be generally acceptable for the federal government to preempt local policy in cases in which the risks of technology are global and the sources of those risks difficult to localize or control, such as the effects of fluorocarbons on the ozone layer. A reasonable case for federal standards can also be made where risks, while locally controllable, are evenly distributed — such as in the use of medical x-rays. However, where there is differential rather than global impact, where certain citizens are more greatly affected or more at risk, the case is not so clear.

Should those citizens who live near a nuclear power plant have a right to form their own policy? In cases such as the storing of nuclear wastes, certain population groups are asked to bear a substantial risk so that other sectors of society, often in a different political jurisdiction, may benefit. Is it enough for them to have special participation in the setting of federal policy, or should they be allowed to formulate a local policy? If federal policy is to preempt local policy, should localities that bear a greater risk be compensated? If so, by what criteria should the level of compensation be determined? Finally, there are issues such as the availability of experimental drugs that create conflict between individuals and the State. Who should determine personal levels of safety? Deciding the answers to these questions is a major bargaining point in the renegotiation.

A second clause in the new contract must deal with the mechanisms by which the public is to make its many voices heard. Much of what has passed for public participation in sci-tech decision making in the past has been of the passive type. Accordingly, the public is given a chance to respond to a proposal, or set of guidelines or regulations, only after they have been drawn up by technical experts. The open hearing is the standard mode of this form of public participation, as is solicitation of responses to regulations published in the

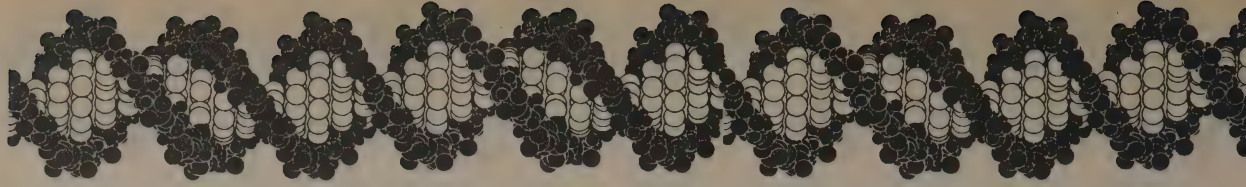


Connections

SECULAR SCIENCE

Much has been written in the past twenty years about the public's antiscientific attitude. This appears to be a misinterpretation of the evidence. The public has not turned against science, but toward responsible science. Furthermore, people have perceived that the best way to insure greater responsibility is through their own participation. University of Chicago historian and philosopher of science Stephen Toulmin has described the public's mood in the following way: "A lot of the difficulties that arise about the relations between the scientific community and the rest of society at the present time have important and significant parallels with the medieval problems of relations between church and state. . . . What we're faced with . . . is the Protestant Reformation. What we're faced with is a demand from the rest of society to be let in on the whole system of ecclesiastical courts. . . . I think that the public suspects that the closure of the mechanisms of discussion is, in effect, a way of keeping them from the debate about things that are really their business."

Seen in this light, science's fall from grace should not be interpreted as a sign of absolute disaffection for science. Rather, it is the realization that in our secular society no institution is allowed to exist in a perfect state of grace. ☛



Federal Register. The trouble with this passive mode of participation, however, is that most of the fundamental decisions have already been made by the time the public is asked to react, and subsequent, permitted changes are usually marginal. It should also be obvious that such a system strengthens the power of the "knowledge elite."

The last few years have seen the laying of the foundation for a new, active type of public participation. A number of organizations of scientists and engineers have been formed to provide better scientific and technical information and expertise to nonscientific groups in order to permit them to react more effectively and at earlier stages. The National Science Foundation's Office of Science and Society funds a number of programs designed to facilitate informed interactions between the public, the government, and the scientific community.

Increasing numbers of nonscientists are being appointed as active members of scientific advisory panels and citizen advisory groups. While the desire of affected parties to participate in sci-tech decision making is increasing, that desire often conflicts with efficiency, economy, and the need for special knowledge imposed by complexity. Finding an appropriate balance between democratic participation and expert competence is a major task of the renegotiation.

Certain other clauses are suggested by a number of interesting and timely questions: How can the public achieve a measure of participation regarding sci-tech decisions made in the private sector? How can professional scientists and engineers enter into public policy debates and still maintain an authority based on unbiased knowledge? How can the public be educated in order to be better equipped to help make sci-tech decisions? Ultimately, as Gerald Holton has suggested, the new contract will not much resemble the old. It will involve each side giving up substantial and treasured items. It will also involve much more mutual involvement and understanding. Each side will have to barter away some of its autonomy if it is to obtain important, monitored benefits and assurances. The new contract is much less a revision of the old than it is a document *de novo*. ☛



Industrial America 1940 — 1960

Science & Engineering Indicators — 1989

Everything you wanted to know about the health of science and technology, and a few things you didn't. The National Science Foundation has published nine of these since 1972; this latest volume is nearly three times the size of the first, skinny effort. The information is gathered from other governmental agencies, the private sector, and foreign countries; this is the volume to consult whether you're interested in bread-and-butter issues such as national R&D expenditures or the more arcane — patent classes most and least emphasized by French inventors patenting in the United States: 1978 and 1988. If it's about science and technology, and if our government knows about it, you'll find it here.

Graphs and statistical tables abound.
—Howard Levine

- The decade-long (1975-85) uninterrupted expansion of support for U.S. science and technology (S&T) has leveled off in recent years (1985-89). With some important exceptions, most indicators of U.S. S&T show significant slowdowns and downturns.

- Four other questions repeated from 1957 also reflect broad public feelings about science. Substantial majorities of Americans continue to believe that science is making our lives healthier, easier, and more comfortable (question a) and that science does not break down people's ideas of right and wrong (question c). In both cases, however, there was less support for science in 1988 than in 1957. Apparently, the more negative sentiments actually developed between 1957 and 1979.

Disappearing Through the Skylight

Everything we used to know as "the real world" is disappearing. That is the thesis of *Disappearing Through the Skylight*, a cross-disciplinary examination of something more fundamental than future shock.

Although the author doesn't quite succeed in pulling his network of observations into a seamless argument, or offer a compelling new vision of where we seem to be heading as a species and as individuals, O. B. Hardison, Jr., carries the reader on such a merry chase across such diverse landscapes of modern thought that the journey makes up for the absence of a definite destination.

The way the book doesn't hang together seems consonant with the vague post-post-modern personality that emerges from the book — people and institutions grown comfortable with fragmentation and contradictions in their minds and lives that would have driven our grandparents crazy. Hardison skillfully relates twentieth-century poetry, architecture, and physics, weaves together Dadaism and postmodernism, literature and television, computer art and artificial intelligence, the Bauhaus and robot musicians, medieval clockmaking and the frontiers of chaos theory, Greek cosmology and theory of language, Plato and Christos, Tristan Tzara and George Lucas.

The author focuses on changes in nature, history, language, art, and human evolution that have taken place since the beginning of the twentieth century:

"Because the changes have been fundamental, the concepts — and even the

vocabularies and images in which the concepts tend to be framed — no longer seem to objectify a real world. It is as though progress were making the real world invisible."

"This book is about the ways culture has changed in the past century, changing the identities of all those born into it. Its metaphor for the effect of change on culture is 'disappearance.'"

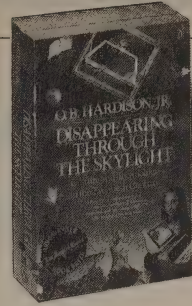
Architecture, in alliance with technology, is dissolving age-old cultural differences around the world. Skyscrapers, suspension bridges, Holiday Inns, McDonalds, or condominiums look the same in Singapore, St. Louis, New Delhi and New England. The emergence of a global architectural style hastened the disappearance of regional differences.

Hardison directs attention to the last poem of Stephane Mallarme, "Un Coup de Des" ("A Throw of the Dice"), in which the blank space of the page emerged as an important part of the text, while the theme of the poem addressed the disturbing centrality of randomness in the universe — a theme that seemed to be emerging at the same time from the equations of the quantum physicists, who were horrified by the implications.

The emergence of randomness in the visual arts at the beginning of the century was mirrored in the language arts by Dada, sound poems, and concrete poetry. *Disappearing* traces the hidden line of development linking avant-garde riots in pre-war Paris to contemporary mathematicians who cannot depict their discoveries without paintings and cannot create the paintings without computers.

Terminator 2 reflects a different zeitgeist than *Star Wars*. The possibility that machines might take over the reins of planetary management has a more abstract, but no less disturbing, psychological counterpart in the possibility that our relationship with machines might already have altered our conceptions of ourselves: "Is the idea of what it is to be human disappearing, along with so many other ideas, through the modern skylight?" —Howard Rheingold
[Suggested by Shel Kaphan]

In a society in which there is regular, easy, and deep intercourse between humans and silicon devices that converse in natural languages, machine intelligence will be a *de facto* reality regardless of the logicians. Winograd asserts that a computer "can never enter as a participant into the domain of human discourse." This is probably true for human discourse as it has traditionally existed, but traditional discourse is not relevant. "Human discourse" is plastic. It changes as culture changes,



Disappearing Through the Skylight

O. B. Hardison, Jr., 1990; 416 pp.

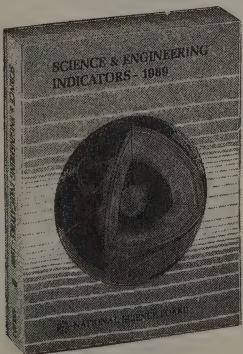
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though more gradually. As society accommodates silicon devices, the new situation will change the meaning of every term used in discourse. Winograd, himself, admits the point, even though he fails to give it sufficient weight: "We exist within a discourse, which both prefigures and is constituted by our utterances."

Exactly. The comment is remarkably close to Turing's original posing of the problem of thinking machines. Recall Turing's prediction: "I believe that by the end of the century the use of words and general educated opinion will have altered so much that we will be able to speak of machines thinking without expecting to be contradicted." Winograd is talking about absolutes, which probably do not exist. Turing is talking about cultural conditions, which most emphatically exist and are describable. He is practicing, you might say, a kind of "future anthropology."

Because of its close alliance with technology, architecture objectifies the forms of modern culture with great clarity. Since the turn of the century, a global architectural style reflecting the state of the art at the moment of design has begun to replace local and traditional styles. Thus a suspension bridge has the same form whether over a gorge in the Himalayas or the mouth of San Francisco Bay. A Hilton Hotel offers essentially the same accommodations whether in Tokyo or Denver, and the visible similarities are objective manifestations of invisible similarities in, for example, administrative structures and accounting and financial policies. By the same token, a McDonald's hamburger is the same in New York and Rome, and a Pepsi-Cola produces the same bubbles in Vladivostok and Grand Rapids. In all of these cases, the effect of change has been the disappearance of regional and parochial identities and the emergence of a global consciousness.

The universalizing process of technology has touched every facet of culture. As this has happened, the sense of individuality has inevitably faded.



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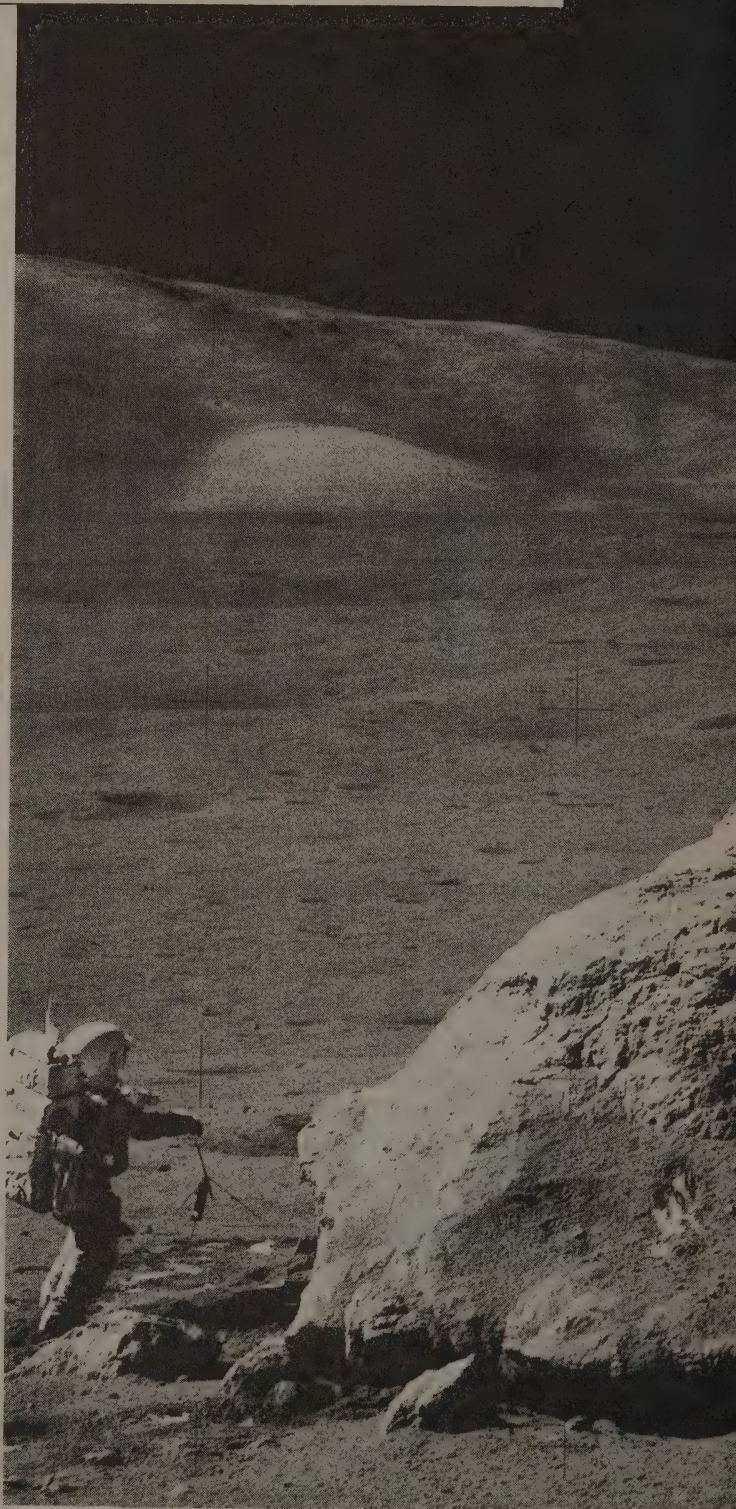
NASA Goes To Ground

BY WENDY ALTER AND JAMES S. LOGAN

Twenty-five years ago, NASA was an enterprise of mythic, heroic quality. The popular phrase for planetary problem-solvers was "If they can put a man on the moon, they can . . ." But now, even technophiles argue against government-funded Big Science on the ground that "these are the same people who brought us NASA." How did something that once worked so well turn into something that doesn't? The authors of this article have the background for tackling a question like that. Because there are so many armchair theorists in this particular field, Alter and Logan's backgrounds are worth noting.

In the eighties, Wendy Alter worked at Marshall Space Flight Center for several years in the Space Sciences Laboratory. She accumulated about five hours' weightless experience on NASA's KC-135 low-gravity-simulation aircraft. ("At 30 seconds of weightlessness per parabolic maneuver, followed by a 2-g pullout, flying up to 40 parabolas in succession, that's a hell of a rollercoaster ride! In fact, Jim and I met for the first time under weightless conditions.") She directed research on advanced shuttle materials, especially turbine-blade superalloys, and was with NASA when the first shuttle was launched. Alter was working in the Failure Analysis branch at the time of the Challenger explosion, where she assisted in testing and performed data analysis for the O-ring investigation. She left the agency in 1988.

James S. Logan, M.D., joined NASA in 1982 and spent two years as chief of the Flight Medicine Clinic at Johnson Space Center, as personal physician to the astronauts and their families. Then he served as chief of the Medical Operations Branch (Life Sciences Division) for three years, providing direct medical support for 25 shuttle missions. During that time he was project manager for the Space Station Health Maintenance Facility, directing a team of 25 physicians, engineers, and technicians responsible for requirements definition and design of the clinical medical facility for the space station. He managed the Life Sciences Division of the Space Station Office for two years, then moved to NASA Headquarters in 1988 where he served as: Manager, Aerospace Medicine; Life Sciences Liaison Officer, NASA Space Station Program Office, Reston, VA; and President, Space Medicine Branch of the Aerospace Medical Association. Jim led NASA's telemedicine team after the earthquake in Armenia; he left the agency in 1989.
—Howard Rheingold





IT WAS THE BEST OF TIMES. A young, aggressive, confident government organization, in partnership with America's premier aeronautics industries, had succeeded in doing the impossible: putting a man on the moon in eight short years. The National Aeronautics and Space Administration, barely eleven years old at the time, became the symbol for American technical, scientific, and operational superiority. No one imagined that NASA would go anywhere but up.

Giants stalked the halls of NASA at headquarters in Washington and at the field centers in Houston, Cape Canaveral, Huntsville, Pasadena, and Moffet Field. Men like Werner von Braun, Robert Gilruth, George Low and others became legends in their time. Unafraid to take risks or accept responsibility, they inspired by example and harnessed the collective brainpower, sense of purpose, and enthusiasm of those they managed. The space program brought out the best in almost everyone. Working at NASA wasn't just a job, it was The Mission: human beings were breaking the bounds of the planet, and this was The Team that was making it happen. The flurry of spectacular successes spawned a generation of NASA wannabes.

Not that there weren't obstacles. Created under the auspices of the Space Act of 1958, NASA became part of the Executive Branch of government, which meant that it was civil service. The administrator and deputy administrator were chosen by the president to implement the president's own space agenda. As part of a strategy to develop and maintain a constituency in Congress, NASA installations were decentralized to Texas, Florida, California, Ohio, and Alabama. And the space agency had to go to Congress yearly for funding. As part of the discretionary budget, NASA competed head to head with everything from housing for the poor to the VA and the EPA. Early on, space proponents were put on the defensive by those who believed in solving problems on Earth before going into space.

Fortunately for NASA, administrations were supportive and the public was awed. There were even those who advocated the space program as a moral and economic alternative to war. After all, the frontier was integral to the American Dream — and America was fresh out of both.

Unfortunately, the US had gone into space for

the wrong reasons. Our goal was to win a contest, a space race. We went as an exercise in national self-aggrandizement, not because space had any perceived intrinsic value. To be fair, there were scientific discoveries along the way, and numerous spin-offs to the private sector, but exploration and discovery were never real justifications for the space program.

Barely a year after the Eagle had landed, the Nixon administration canceled the final four planned missions to the Moon, and the demobilization of the most successful technical organization in history was begun. NASA saw its work force cut by 40 percent; its budget, which reached a peak of 4.5 percent of the 1967 federal budget, had been slashed by over 75 percent by 1974. Even before the Apollo program ended in 1972, it was clear that NASA was losing much of its most creative talent. Whereas the 1960s had seen tremendous growth in the space agency, the 1970s were a decade of retrenchment. From the end of the Skylab program in 1974 to the first flight of the space shuttle in 1981, only one manned mission was flown: the Apollo-Soyuz test project in the summer of 1975, performed for political reasons with ten-year-old technology.

IN THE ABSENCE of a clear mandate and a higher vision, during the seventies the agency's attention became focused on its own survival. This meant developing big, ongoing programs that would be difficult for Congress to cancel once underway. The agency occupied itself with increasing bureaucratization; layers and layers of management evolved, fiefdoms were carved out among the Centers and within them. Communication between the far-flung installations dwindled as the Dark Ages of space exploration descended.

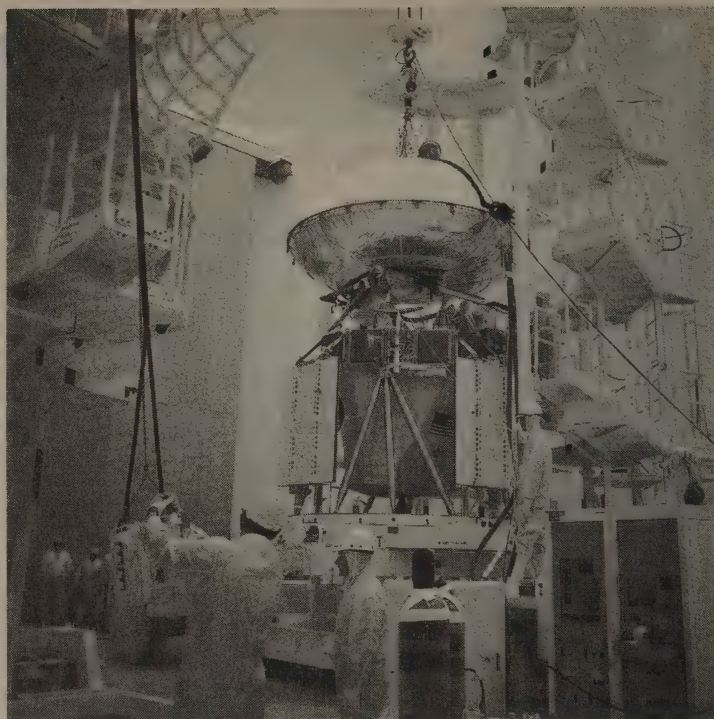
As its organizational survival strategy, NASA sought to eliminate competition to the space shuttle for access to low Earth orbit. The shuttle became the Space Transportation System (STS), a designated "national asset."



Through deft political maneuvering and with a blind eye to the shuttle's obvious operational deficiencies, the agency successfully lobbied to become the only pathway to orbit for most American payloads. Success would guarantee continued existence for NASA as a transportation service. No one acknowledged that this policy created a giant single-point failure, nor was much attention given to developing strong justifications for making the trip in the first place. The hardware was more important than its purpose.

The isolation of internal organizations from each other led not only to rivalry between Centers but also to the entrenchment of an inefficient, bureaucratically intensive "over-the-wall" approach to the design, fabrication, and test of flight hardware. NASA's modus operandi now, this process is a series of largely independent steps: A planning team develops requirements for a piece of hardware. They throw the requirements "over the wall" to a completely different team, which generates specifications. From there, it is thrown over the wall again to a fabrication team, which builds a prototype. Then over the wall to materials, safety and reliability, flight hardware construction, flight certification, training, and so on. There is little interaction and virtually no feedback. Any post-design changes ripple back through the system causing major trauma, significant time delays, and huge cost overruns.

NASA's solution to the problem? More bureaucracy. Change Boards were set up to literally prevent changes by imposing such paperwork hurdles that all but the most imperative modifications were denied. Layers of jobs sprouted around each function and the turf became yet more clearly delineated. Far from the state-of-the-art organization it is portrayed to be, the agency has routinely been forced to "freeze" technology seven to ten years prior to a mission just to get a piece of hardware from conception to flight. This is compounded by the growing trend to contract out not only most aspects of design, fabrication, and testing of hardware, but studies, technology assessments, and fundamental research as well. NASA engineers and scientists function increasingly as contract managers, growing more distant from the hands-on hardware development or research process. And the first imperative of the prime aero-



space contractors — the maintenance of plum "cost-plus" government contracts — clearly does not contribute to rapid, efficient problem-solving.

DURING NASA's post-Apollo organizational retrenchment in the seventies, the climate in the ranks became more attractive to civil servants than to bold thinkers. The ponderous procurement system and increasingly outdated facilities were tolerated by employees who had nothing much more important to do than fight their way through paperwork. For a decade there was virtually no hiring at NASA, no new blood, no new ideas. Those who enjoyed the government benefits and didn't mind working in an undemanding atmosphere remained and eventually began filtering up into management positions. The unofficial motto became "Don't rock the boat," and this was directed not just against agitators, but also against achievers whose enthusiasm might arouse potentially embarrassing expectations.

By the time the shuttle was ready to fly, the agency was so mired in bureaucracy that meeting the challenges of an active flight schedule proved difficult. To compound the

(Above) Under sterile conditions, technicians mate the Viking 1 orbiter and nuclear-powered lander in preparation for the August 1975 launch. This was the first American space vehicle to land on another planet. Despite this success, the Viking program has been supplanted by the Space Transportation System (aka the space shuttle) and the Space Station program.

(Opposite) The space shuttle Challenger hurtles skyward on its June 1983 launch. Bureaucratic bungling was responsible for its explosion in January 1986.

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problem, the older engineers, those with Apollo experience, were by now retiring in droves. Finally the ten-year hiring freeze was lifted, and an effort was made to attract fresh best-and-brightests. However, the civil-service system made it extremely difficult to bring in outside experienced (i.e., expensive) senior-level personnel, while hiring co-op students and fresh graduates to fill the trenches was comparatively easy. Despite programs initiated to develop professionalism in the young recruits, the general experience level in the ranks dropped alarmingly.

The agency desperately needed people who were genuinely interested in working. The new generation of scientists and engineers found they could assume as much responsibility as they were willing to accept. Some of the young people proved to be real firebrands in the old NASA tradition, struggling to revitalize sluggish projects, reform wayward contracts, refurbish outdated facilities. Yet the stifling civil-service environment created frustration at every turn. Some left for private industry. Others stayed, but made the decision to "stop caring so much."

In the mid-eighties, things really began to go wrong. Problems grew larger, more frequent and stubbornly persistent. A common response was not to seek the swiftest and best solution, but to seize upon problems as opportunities to build turf, justify facilities' expansion, and compete for funding. Management, uneasy about accountability in decision-making, proceeded to insulate itself by creating a plethora of committees to "study the problem" and come up with tepid recommendations that would not undermine the status quo. Dissent was anxiously avoided, information duly sanitized. The launch decision that resulted in the Challenger explosion finally brought NASA's inadequacies before the eyes of the public.

THE SINGLE best strategy for making NASA functional again would be to withdraw it from the civil-service system. One frequently mentioned idea is the GOCO (government-owned, contractor-operated) option, similar to NASA's own uniquely successful Jet Propulsion Laboratory (operated by Cal Tech) or various national laboratories such as Oak Ridge and Los Alamos. A case can be made for putting the agency under the management of a top university consortium and providing committed funding (i.e., authorized several years in advance) to permit long-term planning. The traditional intellectual independence of the academic community, its insistence on "good science," might confer some protection from political pressures in program decisions. As other pluses, the university network would provide ready access to a broad range of expertise and could further encourage international scientific cooperation.

Although academia has its own management pitfalls, as contractor it would liberate NASA from a variety of deadly civil-service obstructions. Through unrestricted hiring policies and salaries competitive with the private sector, for example, crucial experience and creativity could be attracted (and retained). At the same time, civil service's tenure-gone-wild policies must be terminated. And rigorously streamlining the procurement system should eradicate the typical three- to twelve-month delays.

Over-the-wall engineering must be replaced by concurrent engineering, in which a "tiger team," consisting of representatives of all departments and/or organizations responsible for getting a piece of hardware out the door, manages the process from end to end. Numerous studies have demonstrated that when those responsible for design, engineering, fabrication, testing, materials, and operations sit down together at the beginning of a project and attempt to prevent problems, the result is shorter development time, fewer engineering changes, and significantly higher overall quality.

Finally, NASA must commit to a new leadership style, creating by merciless débridement a lean, efficient, powerful, and fully accountable management. Emphasis should be given to developing versatile, long-term laboratory



capabilities rather than project-specific facilities; the organizational structure of the agency should reflect this policy.

But restructuring alone will not be sufficient to revitalize the agency. NASA not only needs a new approach, it desperately needs a new vision. Fundamentally, NASA fails to make a case for space that resonates in the hearts of its present congressional and tax-paying supporters. Recent presidents have chosen to use NASA for promoting American public relations, rather than to pursue a sincere commitment to its ostensible role as technological innovator. The apple-cheeked, red-white-and-blue image which has been created for NASA is entertaining for schoolchildren but permits no embarrassing public failures, nor does it inspire the thrill of true discovery which entails risk and requires genuine heroes and intellectual adventurers.

If a lack of vision for the agency helped create the present condition, the civil-service system keeps it that way. Many upper-level NASA managers and laboratory engineers admit sadly that NASA could not now return to the moon in eight years. It's not just that the infrastructure from the Apollo program is gone and the agency would have to start from scratch. The painful conviction is that it literally couldn't be done by the present agency.

Unfortunately, NASA only knows one song to sing. The Space Station program provides dismaying proof of this. Viewed as another massive, long-term program which will justify the existence of the agency for another ten or fifteen years, the focus is again on hardware rather than purpose. In fact, there is no clear agreement about what the Station will do. In a replay of the mistakes of the shuttle program, the Station was sold as all things to all people, incorporating every possible activity that might be conceived for a weightless environment with an orbital vantage — many of which are just physically incompatible.

Clearly, for a facility as complex as the Space Station, a comprehensive, meticulous systems-design effort with emphasis on concurrent engineering is mandatory. Yet the national political climate induced the agency to adopt the deplorable (but so far successful) strategy of rushing to bend metal as quickly as possible so that Congress would not cut the program. During the initial design of the sta-

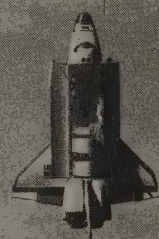
tion, managers were committed first to establishing a program, no matter how badly flawed. The attitude was, "We'll fix it later."

Even more dismaying is the proposed Mission to Mars, a poignant attempt to recreate the glory of the Apollo days. At a tremendous cost, Americans get flags, footprints, and rocks — but no permanent infrastructure, nothing with which to build a secure presence in space, or to solve the problems of our own planet. Even the pure scientific information from such a mission could be obtained more easily and inexpensively with unmanned probes. Again the president is seeking to wave NASA like an American flag rather than asking which aspects of space technology would give us the best return on our investment.

The climate in America today will not support such an attempt. The president and the space agency should read the pulse of the country and choose instead to focus on one of the other proposals that have been offered for consideration: Mission to Planet Earth. The resources of space technology could be best utilized to investigate the complexities of our own planet and the requirements of the life it supports. (The discovery of the loss of atmospheric ozone is one well-known example of such a function; establishing a global telemedicine network might be another.) A powerful, effective research organization dedicated to this mission is badly needed and would garner popular support. Even those with little enthusiasm for space activities are enraptured by NASA's beautiful photo of our blue planet glowing against the vast black emptiness of space. There is deep emotion here, a longing and an energy waiting to be tapped. If NASA is to be revitalized, Earth, not space, may be the source of its vision and its constituency.

The agency seems either unwilling or unable to commit to developing a lasting and reliable space infrastructure, or to a space program in tune with the pressing global environmental issues of the twenty-first century. The authors consider themselves proponents of both. As it stands, unfortunately, being pro-space and pro-NASA may be mutually exclusive. ☹

*Restructuring
alone will not
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to revitalize
the agency.
NASA
not only needs
a new
approach, it
desperately
needs a new
vision.*

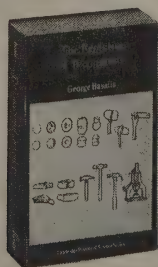


The Evolution of Technology

Both the tech-happy and the tech-wary will find news in this view of technology as an evolutionary system. Fascinating case studies show how society-bending inventions — even “breakthroughs” — proceed from small, incremental variations upon earlier inventions. The revolutionary Bell labs transistor descended, with modifications, from the old-time “cat-whisker” crystal radio; Eli Whitney’s “new” cotton gin had antecedents in Egypt; Watt’s steam engine, often credited (or blamed) for the Industrial Revolution, was the child of a whole lineage of older working steam engines. Few things are as new as they look. Another way of saying that is: All the inventions that will push and stress our society in the near future are already alongside us in their penultimate forms. —Kevin Kelly

In his utopian novel *Erewhon* (1872) and essays such as “Darwin Among the Machines” (1863) Samuel Butler whimsically explored the idea that machines developed in a fashion remarkably similar to the evolution of living beings. His ideas inspired the popular evolutionary fantasy novels of nineteenth- and twentieth-century science fiction in which rapidly evolving machines surpass and supplant humans whose own evolutionary development has stagnated. Butler’s influence is also evident in modern speculative essays that predict either the coming of a new symbiotic relationship between humans and machines or the supersession of humankind by new forms of technology that are capable of self-replication, such as robots and computers.

The ease with which barbed wire can be made has led historian of technology D. S. L. Cardwell to suggest that it could well have been invented long before the third quarter of the nineteenth century, perhaps in ancient Greece. We might question the idea of barbed wire in classical antiquity and move the date forward to the Renaissance



The Evolution of Technology

George Basalla, 1989; 300 pp.

\$10.95 (\$12.95 postpaid) from Cambridge University Press, 110 Midland Ave., Port Chester, NY 10573; 800/872-7423 (in NY: 800/227-0247) (or Whole Earth Access)



Excess of novelty: American smokestack spark arrestors (1831-57). The smokestack designs depicted here are fifty-seven of the more than one thousand that were patented in the nineteenth century.

when wiredrawing was first practiced on a large scale, but even that shift would not invalidate Cardwell’s contention that such a simple artifact, crafted from twisted lengths of wire, could have been made much earlier than it was. The invention of barbed wire certainly did not depend on the advancement of scientific knowledge or on the perfection of some complex and precise technological process. Why then did it first appear in late nineteenth-century America? Or more specifically, what were the prevailing conditions that led three men to invent barbed wire in DeKalb, Illinois, in 1873?

Nationalism also played a part in maintaining the nineteenth-century belief that technological development was essentially discontinuous. The same exhibitions that glorified industrial progress, and the men who made it possible, were also used to measure the relative industrial growth of nations through an award system that honored those countries with the greatest industrial accomplishments. For the first time in history, technological achievements were included in the determination of a nation’s status in the world. Technology became a factor in international affairs and rivalries.

Given this amalgamation of technology with national interests and prestige, patriotic pride dictated the writing of chauvinistic histories of inventions that attributed the most important ones to fellow countrymen and passed over the work by individuals in other countries, no matter how talented or influential these inventors might be. A bizarre situation thus developed in which the heroic inventors of one country were scarcely acknowledged in another land. To take a well-known example, the “inventor” of the incandescent electric light bulb is Sir Joseph W. Swan in

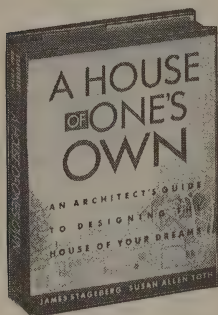
Britain, Thomas A. Edison in America, and A. N. Lodygin in Russia. Similarly, the Russian assertion that A. S. Popov invented radiotelegraphy is disputed by those in the West who designate Guglielmo Marconi as the inventor. In sum, parochialism limits the acknowledgement of the prior work done by technologists in other countries, focuses attention upon the *de novo* emergence of inventions from the solitary labors of heroic nationals, and favors a revolutionary approach to technological change.

Given the nature of technology and technological change, inventor and public alike are apt to forget, or at times deliberately suppress, the debt owed to a key antecedent. Whitney’s first gin bore a strong resemblance to the Indian *charka*, but that likeness was quickly lost as the machine evolved into its modern form. Few realize that important features of the modern automobile’s form, structure, and mode of manufacture were derived from the bicycle, yet the first automobiles were little more than four-wheeled bicycles — Henry Ford called his invention a quadricycle — powered by gasoline engines. Likewise, few are aware that modern electronic digital watches share with the oldest mechanical clocks a peculiar mode of measuring time — the division of a temporal interval into equal discrete units or beats. An escapement performs this function in a mechanical clock, a vibrating quartz crystal does it in the digital watch. Although this division into beats is not the only way of telling time, it was the first successful way of doing so and it has persisted.

A House of One's Own

We've reviewed housebuilding from the standpoint of the owners (*House, WER #50*, p. 86) and their contractor (*The Well-Built House, WER #62*, p. 55). Here it is from a skilled architect who explains what he does and why, as he designs *Wind Whistle* for his coauthor wife. Whether you agree with their tastes and concerns or not (I mostly don't — too inefficient and grandiose), you'll get a personal, chatty education in how to choose and work with an architect to get the home you want. Watching a designer at work here will help you join a designer at work later.

—J. Baldwin



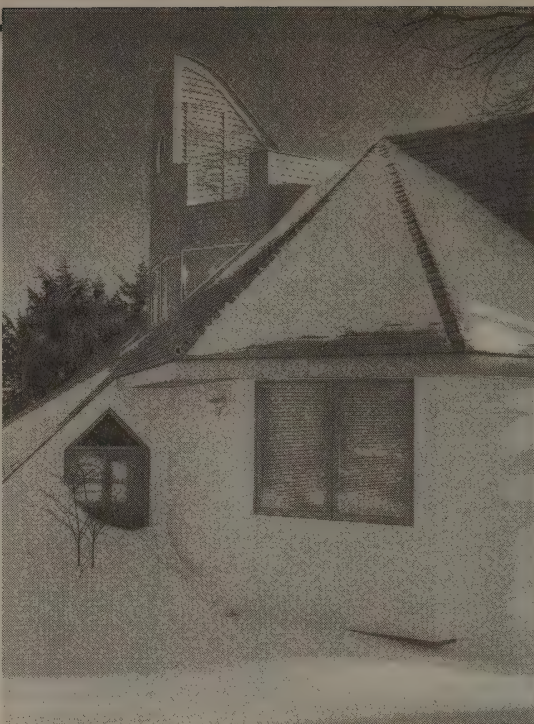
A House of One's Own

James Stageberg and Susan Allen Toth, 1991; 200 pp.

\$20 (\$22 postpaid) from Random House/Order Dept., 400 Hahn Road, Westminster, MD 21157; 800/733-3000 (or Whole Earth Access)

• Clients often tell me, "I like wood." They think they want wood interiors, but what do they mean? So many woods are dark, reflecting little light. Redwood and cedar, used extensively on an interior, can markedly darken a room to the point of gloom. Is this what they mean? Or do they mean woods that are naturally light, like pine, birch, or white oak, or woods that are whitewashed? Because I feel so strongly about rooms that are light inside, I will advise clients to choose the second option. In any case, "liking wood" is only a beginning.

• One of my clients wanted and needed a large house in a neighborhood he loved, which had rather small city lots and modest one-story houses. So I designed his house with four modules or "pods" connected by enclosed short walkways. Each pod contained a logical grouping of functions, such as kitchen/dining/family or living room/master bedroom or children's bedrooms. The steep roofs of the one-story house made it an integrated composition. Now the finished house lies on the lot in such a way that only one or two parts show up from any single vantage point. It is an unobtrusive "good neighbor."



• Most of my clients, like Susan, have neither the knowledge nor the interest in detail to choose, say, redwood versus plywood soffits. "If I'm asked for an opinion on something, I usually have one," she confessed to me, "so don't ask me unless it's really necessary." We were both happy with the process and its results.

The Homebuilt Dynamo

This rather arcane book offers complete (to say the least), copiously illustrated instructions for making your own small, slow-speed generator — a type that is very difficult to find, let alone at a reasonable price. Slow-revving generators are suitable for powering by domestic-scale wind or hydro turbines, or, as in this case, the author's exercise bicycle. (One good workout provides enough battery-stored electricity for his modest daily needs.)

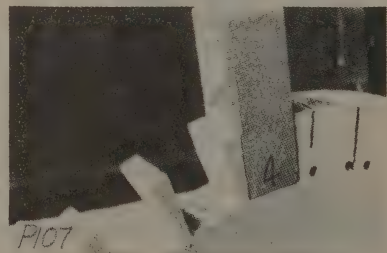
It's hard to imagine a better set of directions for making anything. To me, however, the book is most valuable as an apprenticeship in how to imbue an idea with sufficient intellectual energy and information to make it flicker into being as irrefutable proof-of-concept hardware, a skill not taught in schools or textbooks. The author teaches by revealing how he arrived at his design and fabrication decisions. The patiently explained underlying physics includes worked-out calculations for larger models. Logic and cleverness are balanced by a discussion of his blind alleys and mistakes. Inadvertently, perhaps, it's a rarely seen, intimate and accessible revelation of a designer's thought process.

—J. Baldwin

• [P107] Each of the 32 Rotor Magnets used in the Magnet Rotor are now individually numbered from 1 to 32. They are still in their unmagnetized condition and, as each slot is cut in the Magnet Rotor, it, too, is given a corresponding number. Each magnet must fit snugly into its own slot and



P106: Cutting slots in rotor disk.



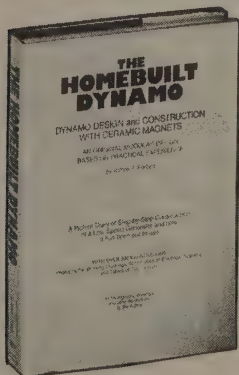
P107: Fitting each magnet to its individual slot.

Kiteworks • Kite Lines

Kite flying has a low bullshit quotient: you can try anything your imagination can deploy, but successful performance is the irrefutable arbiter of your theory, design, construction skill and flying ability. It's a great way to exercise your creative urge. Competition includes vicious, kite-destroying aerial combat, aerobatics, and judging whose bird is the prettiest. Or you can just get something simple into the air and lie there on the beach with the string tied to your big toe. Whatever your fancy, the joyful **Kiteworks** must be considered a classic. Well-illustrated discussions of design, materials (Tyvek housewrap!), construction methods, and flying technique entice and instruct beginners. A rousing assortment of fifty detailed plans invites you to action. Experts will pick up lots of history and lore and perhaps a trick or two, but will probably find the designs a bit obsolete. (High frontiers are celebrated in the ever-excellent **Kite Lines** magazine.)

—J. Baldwin

there may be slight imperfections in the cut sides or bottoms of the slots — and it is far better to discover and smooth out such imperfections (with a file) at this point rather than later on when the magnets have been magnetized, the epoxy glue mixed, and any delay would be very aggravating to say the least. It is hard enough to deal with the magnets after they are magnetized — they tend to slap together or jump apart in the most annoying fashion — without any added difficulty in matching magnet to slot and correcting any slot imperfections when you are gluing them into place! After all slots and magnets are numbered for fit and placement, set the magnets aside in a safe place for now.



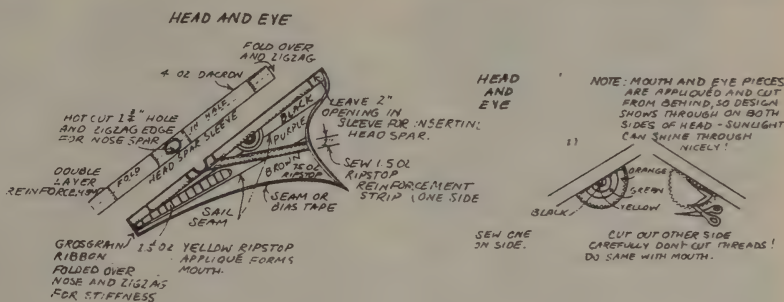
The Homebuilt Dynamo

Alfred T. Forbes, 1987; 182 pp.

\$50 (\$65 postpaid) from Todd-Forbes Publishing, P. O. Box 3919, Auckland, New Zealand



Pterosaur. —Kiteworks



Kiteworks

Maxwell Eden, 1989; 288 pp.

\$14.95 (\$17.95 postpaid) from Sterling Publishing Co., 387 Park Avenue South, New York, NY 10016; 800/367-9692 (or Whole Earth Access)

Kite Lines

Valerie Govig, Editor.

\$14/year (4 issues) from Kite Lines, P. O. Box 466, Randallstown, MD 21133-0466

The 22' x 10' Olympic Delta was ready for its maiden voyage.

I handed Yolen a spool of 500-lb. test leech line. He shrugged, patted his tuna fishing reel, and assured me his 180-lb. test line would do. "Will," I said, "this kite's going to pull like an elephant not a tuna." But he insisted on using his line, so we assumed our lift-off positions.

The kite flew up like a giant patriotic moth. Yolen leaned back to counter the kite's forward pull. Yanked several feet towards the kite, he yelled out that he couldn't believe the incredible pull in such a light wind. Several seconds later, his line snapped as if it were mere sewing thread. Yolen landed flat on his derriere and looked up in disbelief. The kite bucked overhead for an instant before nosing downwards. The Olympic hopeful began its descent by gliding forward; its target was the man with the tuna reel.

Yolen dropped his fishing rod and began running. The kite looked like a fantastic bird of prey — its shadow following poor Yolen as he scrambled for his life across the grass. The kite had a high-L/D [lift/drag] ratio and it seemed to glide forever. Several hundred feet later, the kite swooped down and, barely missing Yolen, dug its nose into the ground on impact. I ran over to Yolen, who was only out of breath. I told him that maybe he should be in the Olympics anyway — as a sprinter. —Kiteworks



The Post-Suburban Metropolis

BY PETER CALTHORPE



The technology of the built environment is easy to criticize and difficult to change, particularly as it relates to our ever-increasing dependence on automobiles. Architect and planner Peter Calthorpe is designing alternatives that are actually getting built. His article "Pedestrian Pockets" appeared in WER #58 (p. 118), and The Pedestrian Pocket Book, to which he contributed, was reviewed in the Whole Earth Ecolog (p. 72).

Calthorpe was recently chosen to create an alternative land-use plan for Portland by the 1000 Friends of Oregon. This influential watchdog group has been responsible for monitoring state legislation setting urban limit lines for Oregon's cities; the task at hand in Portland is to devise transit-oriented development alternatives in hopes of avoiding construction of a proposed perimeter freeway. Calthorpe has also been hired by two of California's fastest-growing counties, Sacramento and San Diego, to develop design guidelines for their new growth areas. His firm, Calthorpe and Associates of San Francisco, has created masterplans for 60,000 acres at sites throughout the US. Among these is Laguna West, a 10,000-person pedestrian pocket currently under construction outside Sacramento. —Richard Nilsen

Walkable Streets:
The scale and character of neighborhood streets must change to provide pedestrian-friendly connections and social places, rather than car-dominated driveways and high-speed collectors. Streets should be tree-lined, with front porches replacing garage doors.



PEOPLE ARGUE ENDLESSLY about growth — where, how much, what type, what density, and if it is really necessary at all. Sprawl is bad, infill is good (if it is not in our neighborhood), new towns destroy open space, masterplanned communities are sterile, and urban redevelopment is fine for “other people.” In all cases, we have been doing a terrible job of building our cities, suburbs and new growth areas; our patterns of growth are dysfunctional, regardless of location or type. The problems of growth are not to be solved by limiting its scope or location; they must be solved by rethinking the nature and quality of growth itself, in every context. We need to start creating real neighborhoods rather than subdivisions, urban quarters rather than projects, diverse communities rather than segregated masterplans; quite simply, towns rather than sprawl.

The quality of growth is dependent on the technology of mobility — the mix and interaction of the automotive, mass-transit, and pedestrian worlds. The car is now the defining technology of our built environment. It sets the form of our cities and towns. It dictates the scale of streets, the relationship between buildings, the need for vast parking areas, and the speed at which we experience our environment. Somewhere between convenience and congestion, the auto dominates what were once diverse streets shared by pedestrians, cyclists, trolleys, and the community at large. And more importantly, the auto allows the ultimate segregations in our culture — old from young, home from job and store, rich from poor and owner from renter. It has come to dominate the public realm, extending the private world from garage door to private destination.

As a piece of technology with a mind of its own, perhaps we should ask what the car wants, or for that matter what a transit system or a pedestrian wants. The car in all cases wants to go fast. Speed has many implications on the built environment — it defines a street system with few intersections and many lanes, it requires wide streets with soft sweeping turns, it wants ever more freeways and ever-larger parking areas. These criteria result in the curvacious superblock arterial system, freeway networks, and parking-lot-isolated land uses so common today. The car wants lots of pavement and the low density development that preserves plenty of space for it. The car also seems to want to travel more; between 1969 and 1983 the national population grew by 16 percent while the total vehicle miles traveled in cars increased 56 percent.

The requirements of a transit system are quite different. Its fundamental desire is for more riders. This requires higher-density land uses (housing at ten units per

acre minimum), dedicated right-of-ways for easy movement, infrequent station stops (one-mile minimums), frequent service (no more than fifteen-minute intervals) and big, mixed-use job destinations like city cores. Destinations need to be mixed and walkable so that riders are not stranded when they arrive. Some transit systems have modest dreams, wanting only to serve the poor and carless on an infrequent basis at slow speeds. Some are very ambitious, looking for urban densities, high speeds, and uninterrupted underground passageways.

The wants of the pedestrian overlap and in some cases contradict the requirements of these other systems. Pedestrians want close destinations — shops, schools, services, recreation. They want direct links to these destinations free of cul-de-sacs, parking lots, or massive intersections. They want safe, interesting, and comfortable streets to walk on, tree-shaded and with houses and shops fronting directly on them for interest and security. They want detail and human scale in the edges and places of a community. Simply put, they want narrow streets lined with entries and porches



Town Centers: Rather than “strip” retail centers lining arterials, the town center must combine civic functions, small businesses, and stores with parks, plazas, transit stops, and daycare. It must collect the daily activities of a community and be a source of identity for several neighborhoods.



leading to local shops, schools and parks — not rows of garage doors on curving streets leading to six lane arterials. Pedestrians also like transit to extend their range of destinations. These wants can be satisfied in either high-density urban centers or small mixed-use towns. The issue is not one of density but of quality.

Each of these systems places differing demands on the environment and architecture. Clearly the car places the greatest stress on the environment while “liberating” architecture from the limits of urban context and human scale. At the speed of the auto, little more than isolated signature buildings will read — the grotesque landscape of corporate symbols and chain-store logos. Mass transit calls for a more dense, integrated and focused architecture than our current planning models require. The pedestrian wants an architecture oriented to the sidewalk, one that provides continuity as well as diversity, and has human scale and detail.

Various environments satisfy different combinations of these wants. The European city works for both the pedestrian and mass transit, but has great difficulty accommodating the car — hence the many movements throughout Europe to ban the car in old city cores. The traditional American town provided for both the pedestrian and the car (back when there was only one car per household), but rarely offered the density or focus needed by mass transit. The modern American city, violated by urban renewal, suburban flight, parking structures, and freeway interventions, fails to fully satisfy the auto, the pedestrian, or mass transit. The modern suburb pleases only the car, leaving both mass transit and the pedestrian unsatisfied.

Given the social, economic and environmental forces of our time, some new synthesis of these three systems is needed. The challenge is to introduce the needs of the pedestrian and mass transit into the auto-dominated regions of our metropolitan areas, not to return to the fiction of small-town America or hope to absorb a disproportionate percentage of growth into urban centers. Urban centers will grow strong if their suburban areas deliver transit riders rather than cars to their core, and if their internal development favors the pedestrian.

Pockets of mixed-use development with streets designed for both the pedestrian and the car will support expanded mass transit into the suburbs. A network of such developments will provide a focus in the suburban environment. This will draw traffic from the overloaded arterial system

and city center, support a transit network, and balance housing and job opportunities within the region. The entire metropolitan framework needs to be layered, with an arterial grid for through auto traffic, neighborhood streets that link homes with local destinations for pedestrians and slow cars, a transit system reinforced by suburban stations with intensified development, and a pedestrian-dominated urban center. Such a metropolitan strategy would simultaneously address environmental, social, and technical concerns, rather than segregating them. It would define a context for an architecture of solutions rather than of anecdotes.

The Crisis of Place in Suburbia

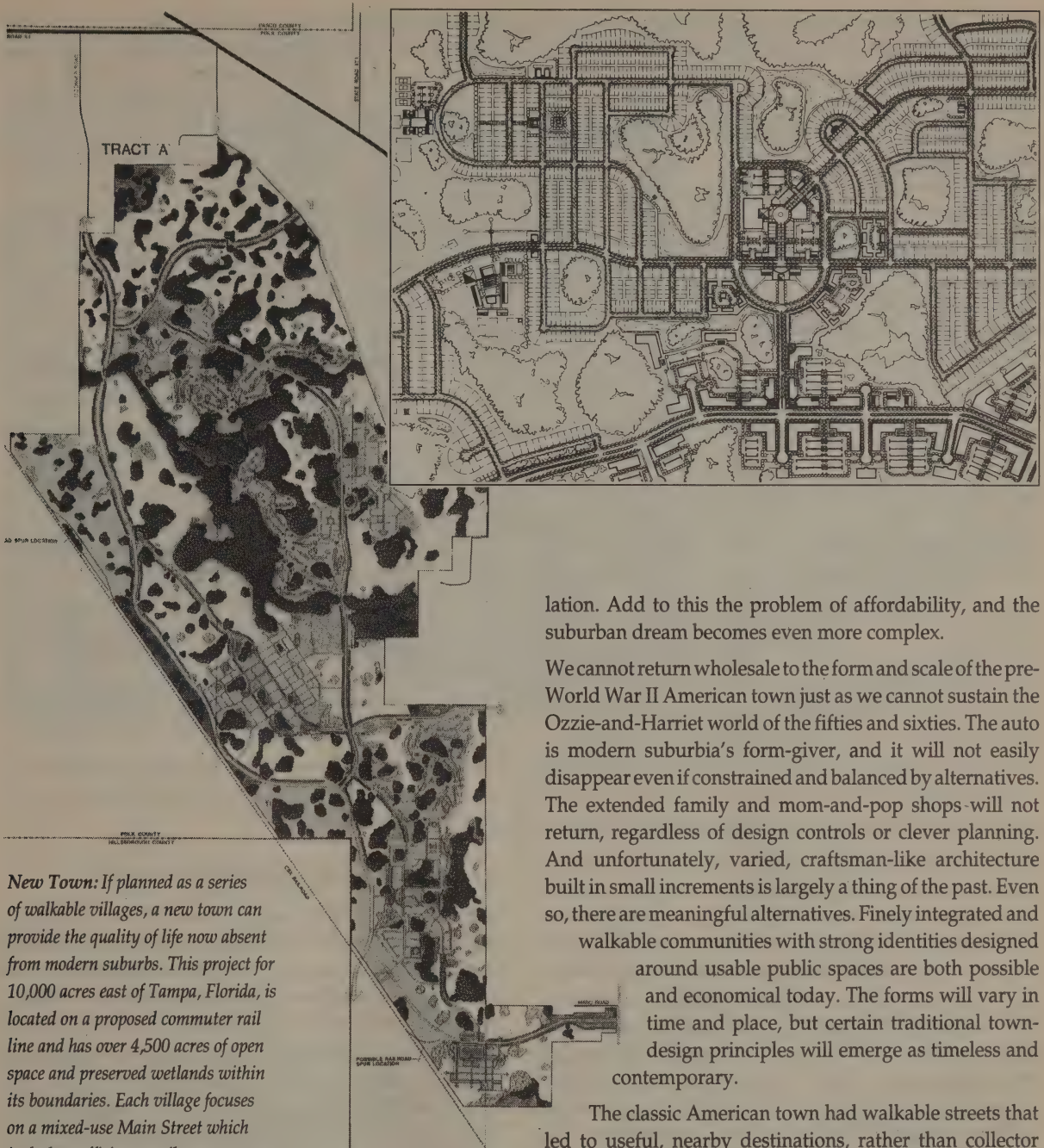
THERE IS A growing sense of frustration and placelessness in our suburban regions, a fractured quality that overlays the unique aspects of each place with chain-store architecture, scaleless office parks, and monotonous subdivisions. Americans moved to the suburbs for privacy, mobility, security, and ownership. Increasingly they now have isolation, congestion, rising crime, and overwhelming costs.

There is a profound mismatch between the old suburban patterns of settlement that have evolved since World War II and the post-industrial culture in which we now find ourselves. This discrepancy is generating environmental stress, intractable traffic congestion, a dearth of affordable housing, loss of irreplaceable open space, and lifestyles that burden working families and isolate the elderly. This mismatch has two primary sources: a dramatic shift in the nature and location of our work places, and a

fundamental change in the character of our increasingly diverse households.

A major shift has occurred in the quality and makeup of the American household. Our old suburbs are designed around a stereotypical household which is no longer prevalent. Of the approximately 17 million new households formed during the 1980s, 51 percent were occupied by single people and unrelated individuals, 22 percent by single-parent families, and only 27 percent by married couples with or without children. In the group with children, the family now typically has two workers. People over the age of sixty-five will make up 23 percent of all new households. The traditional three-bedroom, single-family residence is relevant to a decreasing segment of the popu-

THE auto allows the ultimate segregation in our culture — old from young, home from job and store, rich from poor and owner from renter.



***New Town:** If planned as a series of walkable villages, a new town can provide the quality of life now absent from modern suburbs. This project for 10,000 acres east of Tampa, Florida, is located on a proposed commuter rail line and has over 4,500 acres of open space and preserved wetlands within its boundaries. Each village focuses on a mixed-use Main Street which includes sufficient retail space to meet neighborhood shopping needs, service-oriented office space, and public-use space placed around a village green. This new town would combine 20,000 new homes with 36,000 jobs.*

lation. Add to this the problem of affordability, and the suburban dream becomes even more complex.

We cannot return wholesale to the form and scale of the pre-World War II American town just as we cannot sustain the Ozzie-and-Harriet world of the fifties and sixties. The auto is modern suburbia's form-giver, and it will not easily disappear even if constrained and balanced by alternatives. The extended family and mom-and-pop shops will not return, regardless of design controls or clever planning. And unfortunately, varied, craftsman-like architecture built in small increments is largely a thing of the past. Even so, there are meaningful alternatives. Finely integrated and walkable communities with strong identities designed around usable public spaces are both possible and economical today. The forms will vary in time and place, but certain traditional town-design principles will emerge as timeless and contemporary.

The classic American town had walkable streets that led to useful, nearby destinations, rather than collector streets that funnel into heavy-traffic arterials. Elm Street led to Main Street, or to the neighborhood park, or daycare or the elementary school. Such a pattern is actually cheaper to build and results in shorter trip distances, even if cars are used. The streets are narrow, have sidewalks and are tree-lined. They are fronted by porches and entries rather than garage doors and driveways. They allow through traffic but slow it with frequent intersections and frugal dimensions. Gone are the extremes of soundwalled expressways and cul-de-sacs. Privacy is maintained but partly shifted from the front yard to the neighborhood. Security is provided by eyes on the street rather than gates and armed



patrols. Such streets are practical, not nostalgic. They are practical for single parents tired of being chauffeurs for children unable to walk to most activities. They are practical for the elderly without cars, for single people looking for accessibility, and for working families looking for stronger and safer communities.

The classic American town had diversity of use. So does the modern suburb, but with greater separations. The classic town separated activities: residential streets, commercial streets, school sites, and a formal civic center. But the connections between uses were close, walkable, and direct. (Even our larger cities are use-zoned, with vertical mixed use—in which, for example, a shopkeeper lives above his shop—the exception rather than the rule.) The center of the town integrated commercial, recreational, and civic life rather than isolating them. This is also quite practical today. Commercial centers can benefit from the increased traffic created by civic and recreational trips.

Parks and civic centers are better utilized when located at a hub of activity and within walking distance of residential neighborhoods.

What cannot be directly adapted from the pre-World War II town is its fine grain and scale. We now have larger institutions which resist Balkanization. Retail markets are growing ever larger, with the typical supermarket pushing 60,000 square feet and discount stores reaching 120,000 square feet. The small shops remain but the large anchor stores keep growing—motivated either by the convenience of “one-stop shopping” or the price discounts. These anchors will resist a Main Street configuration, demanding the market area and visibility of a major arterial. Hybrid town centers must combine the intimacy of a main street with the accessibility of strip centers—another interesting design challenge.

The scale of development entities, builders, and land assembly has also grown radically in the last thirty years. Towns no longer grow by individual buildings or even small groups, but by production units of approximately 150 houses or by retail centers of at least 60,000 square feet. Apartments are rarely developed at under 100 units because of management economics. Land developers often bring over 100 acres (the size of a classic town center) through the permitting process with one masterplan. Rather than the architectural diversity of incremental growth, we are confronted by large blocks developed into

formulaic configurations dictated by developer inertia and conservative financing criteria. These huge developments demand innovative design in order to avoid the “theme” quality of isolated subdivisions, shopping centers, and office parks. They require an architecture which integrates them into a larger community without nostalgically imitating the scale and diversity of older towns. At the same time, the architecture must avoid the sterility and highway scale of the modern suburb. The scale of these developments cannot be concealed or denied, but it can contribute to and be made responsive to a larger civic order.

There is a fine but important difference between tradition and nostalgia: Traditions are rooted in timeless impulses while being constantly modified by circumstance. Tradition evolves with time and place while holding strongly to certain formal, cultural and personal principles. Nostalgia seeks the security of past forms without the inherent principles. The current archi-

tectural interest in the classic American town can tilt toward profound and meaningful principles or merely color suburbia with an old-time style. The difference is in the quality and skill of adaptation.

The New Metropolitan Region

REGIONS WITH HIGH growth demand have several fundamental development choices. As is the present standard, towns and suburbs surrounding the metropolitan center can be allowed to balloon out in the typical sprawl patterns. Ideally, growth can be accommodated by locating it in redevelopment and infill locations. Or new towns can be planned within reasonable transit proximity to the city center. Finally, one may attempt to limit overall growth. Such limitations, when they succeed, often spread development into more remote areas receptive to piecemeal projects, increasing commuting distances and creating the ubiquitous hopscotch land-use patterns. Unfortunately, the most common strategy is to allow the spread of existing suburbs and towns, resulting in sprawl, traffic, and a loss of identity for what may have been distinct neighborhoods, villages and towns.

Infill and redevelopment should always be a component of any region's growth policy, but to expect such sites to absorb the majority of new development is often unrealistic. The quantity of sites is often too small to accommodate large numbers, and the time needed to develop such sensi-

A **AMERICANS**
moved to the suburbs for privacy, mobility, security, and ownership. Increasingly they now have isolation, congestion, rising crime, and overwhelming costs.



Edges: New communities should have clearly established edges which form greenbelts around urbanization. These edges should use and respect sensitive habitat, openspace, or agriculture. Each new community should be made distinct by its greenbelt.

tive sites is sometimes prohibitive. The impact of NIMBYs is also having a profound restraining effect on infill development. We all want infill projects to prevent sprawl, but we rarely support them in our own neighborhood.

If planned well, new towns can help structure a metropolitan region by absorbing growth, supporting transit, and creating greenbelts. If truly transit-oriented, new towns can relieve the regional highway system, improve air quality, and support an often-underutilized rail or bus system. Time after time it has been demonstrated that an effective transit system helps to invigorate the downtown. Portland's new light-rail system has been credited with the phenomenal regeneration of its downtown, bringing both jobs and new retail activity to the urban core. Public transit always focuses on the central business district and delivers people, not cars, to the heart of a city. This reduces the need for parking structures and obviates destructive urban freeway projects. Adding more sprawling suburbs to a metropolitan fringe increases pressure for parking and freeways downtown while it competes with the city for jobs and retail

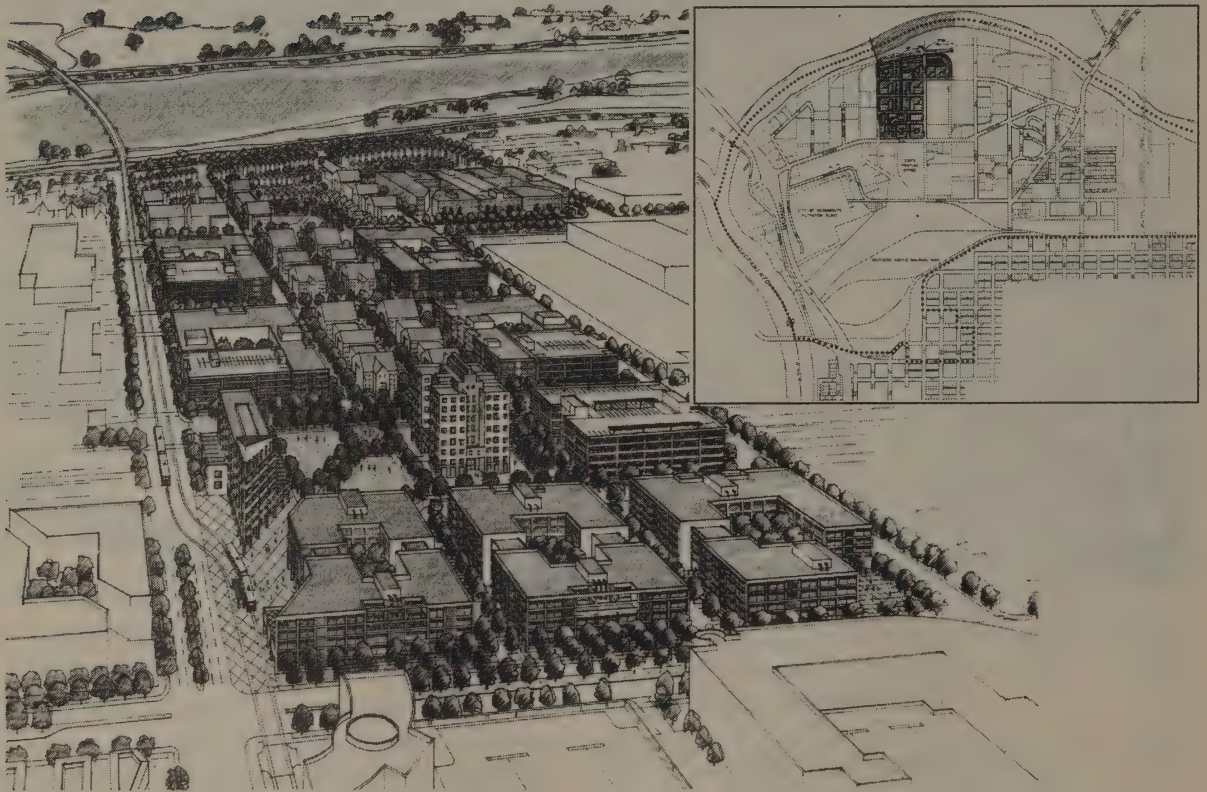
activity. Transit-oriented new towns reinforce the city's role as a region's cultural and economic center.

Greenbelting should always be part of the growth strategy for both new towns and the larger metropolitan region. The two are complementary; a new town can provide greenbelts for the metropolitan area at the same time it buffers its own edges. Failure to use greenbelts with new towns means a fast-growing region will continually expand into the nearby natural edges of open space. Establishing new towns with greenbelts will break the continuous expansion of suburbs.

But modern new towns have a bad name. In Europe, with some notable exceptions, they are sterile and suburban. In America they are sterile, suburban, and (even worse) economic failures for the first twenty years. Are these qualities inherent in new towns, or a result of a dysfunctional design philosophy? After all, our favorite cities and towns were all once new. Is it just time that transforms a new town into a diverse and complex city? Or is it the nature of current economic forces, the technology and sociology of the times,



Infill for a City: In an 51-acre, underutilized industrial section of downtown Sacramento, a mixed-use redevelopment plan is proposed. Located along a new extension of the light-rail line, the project would mix jobs for 6,800 people with 916 townhomes and apartments, 54,000 square feet of retail space, and a hotel. The heart of the project is an "around-the-clock" transit stop that opens onto a major pedestrian plaza lined with retail shops, restaurants, services, and a hotel. Small public plazas and parks are located along the pedestrian spine that links the housing with the transit stop.



and the design of the plan which inhibits or enhances a successful maturation? Certainly the history of planning as it has evolved in this century plays a great role in this question.

At the turn of the century, and again during the Great Depression, the theory of new towns evolved in several directions. Ebenezer Howard and the Garden Cities movement defined a Luddite's vision of small towns, built for workers, surrounded by greenbelts, combining the best of city and country. These towns were sited around rail stations and combined Romantic and Beaux Arts urban traditions with powerful civic spaces surrounded by village-scale neighborhoods. In the same period, Toni Garnier developed the first modernist approach to town planning, segregating industry from housing and freeing buildings

from the street. During the Depression, Le Corbusier and Frank Lloyd Wright expanded the vision in both cities and suburbs while retaining fundamental modernist principles — segregation of use, love of the auto, and dominance of private over public space. The street as the habitable common ground of the community began to disappear. Even in the most progressive of the post-World War II new towns, these basic modernist postulates have compromised, if not destroyed, the ability of these areas to evolve into vital urban communities.

It is hard to pin down the difference between suburb and "new town" these days. Suburbs are acting more and more like modernist new towns; they have jobs, retail, recreation, civic services and a diverse population. They also have the placeless quality of most new towns. And when you study



the planning procedures required of suburban “masterplanned communities” and “specific area plans,” they resemble intentional new towns in scale, effort, and conception. But they are not *real* towns and probably never will be. Both suburbs and many modern new towns lack the fundamental qualities of real towns — center, edge, integrated diversity, and clear public space.

Pedestrians are the catalysts for healthy communities; they make these essential qualities of towns — center, edge, diversity and public space — meaningful. They are the lost measure of community, setting the scale for center and edge. They create the place and the time for the casual encounters that provide the connections and integration within diverse communities. Without pedestrians a city’s common ground — its parks, plazas and sidewalks — become useless obstructions to the car. When this happens, an area’s focus can easily be disaggregated commerce and civic functions easily separated into distant chain-store destinations and government centers.

The essential qualities of towns are absent in virtually all contemporary growth patterns, regardless of the context. Infill urban sites, new suburban development areas, masterplanned communities, and new towns all fail when planned without them. Urban infill sometimes succeeds because the qualities of diversity, clear public space, and a qualitative center pre-exist and need only be honored, not necessarily created. Nevertheless, many infill projects succeed in destroying these pre-existing qualities. Modern suburbs and new towns typically lack real centers, definitive edges, or significant public spaces. They have diversity in use and user, but the diverse elements are segregated by the car. They have none of the casual and spontaneous human interaction that creates vital neighborhoods, quarters, or towns.

The special qualities of place are easily blurred by the speed and isolation we feel in cars. Although pedestrians will not displace cars anytime soon, their absence in our thinking and planning is the fundamental source of the failures of infill and new growth areas. Plan as if there were pedestrians and we may allow kids, the elderly and others to walk again. Plan for pedestrians and we can transform suburbs into towns, projects into neighborhoods, and networks into communities.

In a sense we should be building towns in all growth areas

— infill, suburbs, and satellites. In each context the quality of development should follow the same town-like principles: housing for a diverse population, a full mix of uses, walkable streets, positive public space, integrated civic and commercial centers, transit orientation, and accessible open space. For urban infill, such development can become “new-town-in-town” designs for large parcels, such as Mission Bay in San Francisco. For smaller infill parcels, the task is to complete the mix of a community while honoring the unique qualities of the place. Lower-density, mixed-use neighborhoods can be developed for suburban infill sites with similar principles. These sites are fundamentally the same as new towns except they are smaller, lack the capacity for major greenbelts, and must respond to the idiosyncratic qualities of the surrounding community.

Disaggregated sprawl is destructive wherever it occurs — as infill, suburban growth, or new towns. Projects that are diverse, centered, and walkable are useful in all areas. The specific nature of a metropolitan region will dictate which of these growth areas is appropriate; its rate of growth will indicate how many are needed. Regions with a very slow growth rate may only need incremental infill. Regions with rapid growth and much skipped-over suburban land may need urban infill and new suburban projects. Other regions may need development in all three areas, including new towns, to absorb massive growth without destroying the identity of existing small towns and urban centers. The quality of development we allow, not necessarily its location or size, is the principal problem and opportunity of growth.

These are the design challenges of creating the post-suburban metropolis: to develop a regional growth strategy that uses infill and new growth areas

to reinforce transit, community, and social diversity; to create an architecture that reinforces public space without sacrificing the variety and character of individual buildings; to create a planning approach that integrates the pedestrian into mixed-use, livable neighborhoods; to see the environment as an asset rather than a limit to human settlement; and to evolve a design approach that is capable of accommodating modern institutions without sacrificing human scale and memorable places. These are challenges of greater difficulty (and potential grandeur) than the current struggles between environmentalists and developers, between regional interests and neighborhood activists. They are challenges of real consequence. 🍷

URBAN centers will grow strong if their suburban areas deliver transit riders rather than cars to their core, and if their internal development favors the pedestrian.

Nature's Metropolis

Environmental historian William Cronon has turned his focus to the Midwest and its leading urban center, Chicago. The result is an engrossing account of the ecological and economic interplay between Chicago and its regional hinterlands from European "discovery" until the end of the nineteenth century. Cronon carefully examines how Chicago established itself as the leading Midwestern wholesaler of grain, lumber, and meat during the period when the tallgrass prairies were plowed under, the white-pine forests of Michigan and Wisconsin were cut over, and the shortgrass prairies became grazing grounds for cattle rather than bison.

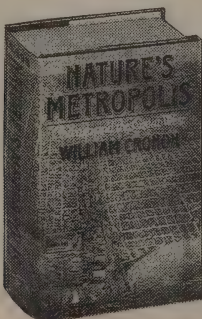
What makes this book so fascinating is not only the tremendous level of detail it provides about Chicago's history, but the larger social and ecological inferences that can be drawn. For example, Cronon points out that technology and finance quickly and quietly led to a layering of reality that caused people to forget their original connections to the local market and environment. In doing so, they became more and more dependent on items brought from various bioregions to Chicago for conversion into commodities, then dispensed through a hierarchy of urban centers. Back then those bioregions were located on the same continent; today the same capital-driven system operates globally.

Read this book, and then imagine Tokyo, Atlanta, Los Angeles, Amsterdam or any other large city. Embellish your choice and its "hinterlands" with the latest in technological, ecological, and economic geography. You will find that we have indeed added many layers between our present urban reality and that which underlies and supports it. By better understanding the alliance between the city and country, perhaps we can begin to dwell as connected beings in the environment. —Dave Egan

Nature's Metropolis

William Cronon, 1991; 530 pp.

\$27.95 postpaid from W. W. Norton & Co./Order Dept., 800 Keystone Industrial Park, Scranton, PA 18512; 800/233-4830 (or Whole Earth Access)



- Before Chicago became a metropolis, one could have described the processes of ecological change in the landscape west of the Great Lakes without making any reference to that particular place. One could have captured the dynamics of local ecosystems by speaking of the seasonal cycling of climate and vegetation, the weathering processes of bedrocks and soils, the migrations of animals, the activities of Indian communities, the perennial return of the prairie fires. But the coming of the city added a crucial new variable to the equation. As its influence extended farther and farther to the west, it drew every local ecosystem into the web of its markets, so the environmental dynamics of western places eventually had as much to do with their hinterland status as with their ecology. The catastrophic changes that forever altered the prairies and north woods had little to do with the ecological processes that had created them. To explain those changes, one must look instead toward the city by the lake, and to the market it represented.

- The paradox of nineteenth-century Chicago was that the same market that brought city and country ever closer together, giving



The Great West as Chicago's corn-cob. In 1891, the Chicago, Burlington and Quincy Railroad distributed a deck of playing cards to favored customers, backed with this image — which speaks for itself.

them a common culture and fostering ever more intimate communication between them, also concealed the very linkages it was creating. The geography of capital produced a landscape of obscured connections. The more concentrated the city's markets became, and the more extensive its hinterland, the easier it was to forget the ultimate origins of the things it bought and sold. The ecological place of production grew ever more remote from the economic point of consumption, making it harder and harder to keep track of the true costs and consequences of any particular product.

Edge City

... lives up to its perfect title. With a warm, vicious wit journalist Garreau explores and solidly explains the current and future convulsions of American cities, exfoliating into adaptive new things at the perimeter that don't have mayors or even names, but they are where urban life — and thus civilization — is being newly invented.

Surprise: edge cities are mainly good news, even for the city cores left behind, even for environmentalists — when we are honest enough to participate in this most robust ecological "edge effect."

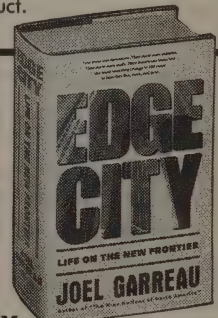
The reporting here is American; the phenomenon is global.

—Stewart Brand

- Already, two thirds of all American office facilities are in Edge Cities, and 80 percent of them have materialized in only the last two decades.

- Cities are always created around whatever the state-of-the-art transportation device is at the time. . . . The combination of the present is the automobile, the jet plane, and the computer.

- "Edge City is an adaptable creature," said Pamela Manfre. . . . "It fixes itself. It redefines itself. It's almost as if we're working out equations. We 'solve for' problems. We 'solve for' commutes. And then we 'solve for' sterility. And then we 'solve for' choice."



Edge City

Joel Garreau, 1991; 546 pp.

\$22.50 (\$25 postpaid) from Doubleday & Co./Fulfillment Dept., 2151 S. Wolf Road, Des Plaines, IL 60018; 800/223-6834 (or Whole Earth Access)

- There is probably no more important law of Edge City location than this: Whenever a company moves its headquarters, the commute of the chief executive officer always becomes shorter.

- Master Planning: . . . In practice, that attribute of a development in which so many rigid controls are put in place, to defeat every imaginable future problem, that any possibility of life, spontaneity, or flexible response to unanticipated events is eliminated.

- Depending on whom you listen to, [Christopher] Alexander is the most innovative thinker in the last one hundred years on the way we design and build our lives; or he is a dangerous radical who threatens the fabric of the building, banking, real estate, and architecture industries; or he is a delusional flake.

Electronic Field Meters

The jury is still out on the possible health effects of electromagnetic field (EMF) radiation. That's not likely to change soon. Since technology has surrounded us with the stuff, the official policy of "prudent avoidance" makes sense as a first response. I've gotten rid of my electric blanket and started measuring distances from the backs of other people's computers during our current office re-shuffle. Some of us are sitting too close to computers we can't even see.

EMF meters are available with prices

and capabilities that vary widely. The product reviewed here is one among many, and the review does not pretend to be definitive.

Robert Horvitz waded into this thicket a year ago "with caveats galore" ("Inhabiting the Electromagnetic Environment," **WER** #68, p. 125). He pointed to a survey review in **Microwave News** where meters ranged in price from \$75 to \$9,500. Horvitz also reviewed Becker and Selden's **The Body Electric** back in 1986 (**WER** #50, p. 55).

—Richard Nilsen

Teslatronics ELF Alert

Sometimes you don't pick an issue to be involved in; it picks you. That's what happened to our neighborhood on the west side of Santa Fe, New Mexico, last year when the local utility announced it was building a 115,000-volt transmission line right down our street. The group we formed to oppose the line thought 85-foot steel towers running through our modest neighborhood would be ugly, but our main concern was the health effects of the EMFs the line would generate.

Anything carrying an electric current — computers, hairdryers, powerlines, the Earth — has a magnetic field. Until about twenty-five years ago, scientists assumed EMFs had no biological effects unless they were strong enough to burn you, as in a microwave oven. Through the research of Robert O. Becker and others, the safety of EMFs has become a hot political and scientific issue.

We found out that the existing powerlines are already radiating high levels of EMFs into our homes. Since you can't tell by looking whether a power line or appliance is radiating high levels or not, an inexpensive meter can be a handy tool. To evaluate the Teslatronics ELF Alert meter, I asked Art Judd, an electrical engineer and electronics consultant, to help. Here's his review.

—Barbara Fix

The electric power we use in our homes and offices is an alternating current. In North America, the current alternates 60 times each second, and this frequency is referred to as 60 Hertz. These power frequencies are also called Extra Low Frequencies (ELF). Electromagnetic fields are generated by this power. The strength of these fields is measured in milligauss (mG). Exposure to fields above 3 mG is cause for concern in some scientific circles.

We evaluated the Teslatronics Model 30P ELF Alert milligauss meter on a walk through Santa Fe. First measurements

were made near an overhead distribution line and a transformer station; later we checked secondary distribution lines in neighborhoods.

The Model 30P is the size of a small calculator and easy to handle. The digital liquid-crystal display reads directly in milligauss. We checked its accuracy against my Walker Scientific Model ELF 50-D meter (which costs around \$250). The power line readings were generally within ten percent of each other, but the Teslatronics meter was extremely position-sensitive, with readings varying several hundred percent depending on the orientation of the meter with respect to the emitting source. At times a variation of a few degrees of angle changed the reading abruptly. The Walker Scientific meter was far less erratic — the readings were more stable and did not jump around as much with movement of the meter.

Moving inside, we checked readings of appliances. Here there was more disparity, and the Teslatronics meter often gave much lower readings. This probably has to do with bandwidths of acceptance,



filtering methods, and various harmonics generated by certain appliances. Overall, the convenient size and lower price of the Teslatronics tends to compensate for its sometimes unsettled readings. As this is being typed, the readings emitted from this typewriter are in the range of 20 to 70 milligauss. —Art Judd

ELF Alert Model 30P

Magnetic Field Milligauss Meter

\$99.95 postpaid from Teslatronics, Inc.,
1 Progress Boulevard, #25, Alachua, FL
32615; 904/462-2010

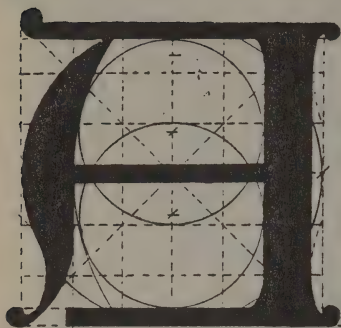
SPECIFICATIONS

- Range..... 1 to 1999 mG
- Accuracy²..... 1% ± 1 digit, typical
- Frequency Response 30-300 Hz
- Temperature Range -10 to +50 °C
- Battery Life 100 hours, typical
- Power..... One 9V Battery
- Weight 4.9 oz.
- Dimensions 4.7"L x 2.4"W x 1.0"D

2. Calibrated at 60 Hz. (50 Hz. optional)

Designer as Savior, Designer as Slave

BY J. BALDWIN



AS THE IMPLEMENTERS OF TECHNOLOGY, DESIGNERS HAVE a mandate to do better.

Technology doesn't just happen, it reaches society as the deliberate work of people acting as designers. Every product and procedure has been intentionally or inadvertently designed to be the way it is. It is an awesome responsibility to place in the hands of persons who are so vulnerable to corruption.

Like politicians and realtors, designers are forced by "the system" to compromise their integrity in order to function. Clients may have very different concerns and ethics than the designers they command. Worse, the clients may not be the end users. Schoolbuses, for instance, are designed to please school board purchasing-committee members. They will never set foot in the things. The result is an ergonomically despicable affront of a ride, as some of you may remember. The hapless students and the hireling driver who must endure it daily have no vote. They are not part of the design process, but they should be.

Most of the egregious waste, pollution and environmental insult caused by technology occurs because nature is left out of the design process. Designers and their masters ignorantly assume that nature has no vote. But nature always votes anyway. As has become obvious, her vote is often No.

Much social exploitation and injustice occurs when the resource requirements and unfortunate consequences of a technology darken the lives of voteless, helpless recipients who never even get to enjoy the advantages. It's called boycott or terrorism when they protest.

When the environment protests by exhibiting intolerable degradation, the principal malefactors customarily dodge responsibility. Their captive designers abdicate. The corporate system is set up (designed!) to shield designers and their masters from financial ruin if protest grows strong. Corporate clout influences politics. Things are arranged so somebody else — most often taxpayers and the poor — will foot the bill. This corruption also disrupts the apparatus of balance and redress. We and our Earth suffer. Technology

is often blamed, which is perfectly logical — we are surrounded (some say engulfed) by the sorry results of many centuries of untamed technological excess. Corporations counter with the classic "guns-don't-kill-people" waffle, but it won't do any more.

Corruption also reduces incentive for the clear, comprehensive thinking necessary for good design. Look around you. Can you name even one building, out of the thousands being erected this very day, that is both delightful and energy- and materials-efficient? Can you name a product that is well designed? The latter task is a bit easier, but your candidate still represents a minority. It's probably a tool, toy, weapon, or object that would cause unacceptable functional problems if ineptly designed.

Like their designers, you probably haven't considered all aspects of your favorites. What did making the object do to the environment and to the workers who made it? What is its overall effect on individual users and on society as a whole? What will be its ultimate fate? Who will pay for the designed object? Who will pay the costs for ameliorating its societal side effects, and in what coin? Have these matters been considered under the designer's mandate, or have they

J. Baldwin started out as Whole Earth's reality tester for alternative technologies, but his expertise has spread to encompass the whole cosmology of technology, from hand tools to nuclear power plants. Here he goes to the core of technology — the mind of the designer.
—Howard Rheingold

been left to chance? Do you consider such things when spending your money?

In this discussion, I am assuming "good" designs to be those that work well in all important ways. The rare good designs that succeed in the market often achieve "classic" status. Those that don't are considered weird, and are used as textbook examples of why innovation, courage, and in particular, altruism are to be avoided. This mindless response occurs despite the fact that many studies have shown that poor sales are most often the result of faulty financial management, poor marketing technique, or bad timing.

It is more common (in all senses of the word) to consider the technology that sells best to be best, whether its designed applications work well or not. Profitability is usually the single, insistent, essentially political, design criterion. It does not directly demand anything more than assured popularity from the designer. Venal as this may sound, it doesn't necessarily predict inept and dangerous design. Why, then, is comprehensively good (not to mention elegant) design so rare?

This question is nothing new; things were no better in the

nostalgically mourned past. Museums, history books and a few preserved or restored examples represent the best of their time. "Ninety percent of anything is mediocre," claimed mathematician Frederic Pohl, with some justification. We notice the bad effects more now because they've multiplied along with the population and its production and distribution capabilities.

Does the foregoing insist that technology is inherently and uncontrollably destructive? Must the undesirable side effects (which are integral — inadvertently designed-in) always outweigh the wonderful aspects, as many critics have suggested? Is it even possible to do better, or is the problem an intractable example of what John Barth called "basic human fuckedness"?

I think that it is possible to do a lot better, and that we'd best get at it soon. Hopeless, helpless abdication and acquiescence fuel irresponsibility as surely as do ignorance and malign intent. Most of us certainly feel frustrated and to some extent helpless as individuals — a state of affairs particularly maddening to young idealists anxious to put their environmental awareness to good use. The feeling of helplessness is unnecessary and inappropriate. It has three major roots, all inimical to effective individual action.

Biologic

The subtitle for this hip, sassy and wonderfully useful book is "Environmental Protection By Design." It's a rare pleasure to read it, something that I can't say for most of the zillion environmental books that have crossed the Whole Earth threshold. There's not a whiff of tiresome, guilty, faintly whiny ecoblahblah, and no quick fixes are offered. Instead, David Wann has given us, almost as a gift, a witty guide to thinking and designing our way out of the messier aspects and dangerous stupidities that sully technological society. It's a manual of good sense and successful strategies, and one of the best introductions to environmental principles I've seen. A great review/reminder book. Well designed, too. You need one.

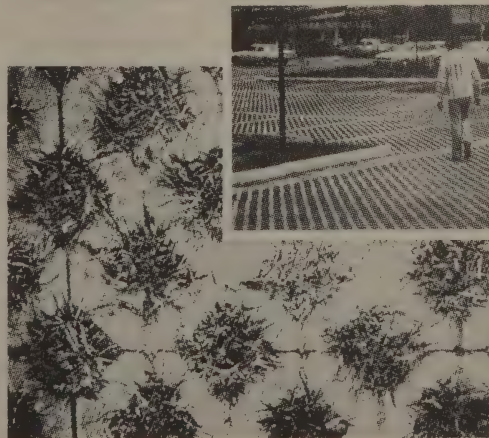
—J. Baldwin

• Ecosystems are important for two basic reasons: they are inherently valuable in and of themselves, and our technologies need to fit them. That's the crux of our environmental situation — our designs don't fit. Many of them are as unsuited for their surroundings as a loaded gun would be at our kids' birthday parties.

• Engineers tend to be problem-solvers, not problem-avoiders. If you want to get from

point A to point B, they can muscle you up a superhighway, but they're not expected to give a damn about how scenic the trip will be. Their focus is on the destination, not the journey; the product, not the process. "You want to make the dog happy? No problem, we'll rig you up a mechanical tail-wagger." Ecological designers see the absurdity of such a contraption, and relate to the other end of the dog, where those brown eyes are saying, "Just let me fit in."

In a nutshell, conventional engineering is logical enough, but it's not biological.



Biologic

(Environmental Protection By Design)
David Wann, 1990; 284 pp.

\$11.95 (\$13.95 postpaid) from Johnson Publishing Co., 1880 S. 57th Court, Boulder, CO 80301 (or Whole Earth Access)



City pavements permit pollution to run off into streams and rivers, killing wildlife and contaminating drinking water supplies. "Porous pavers" allow precipitation to go into the ground where microbes can break down the chemicals. This design can also help keep a city cooler.

First is that virtually all of us, male and female, are brought up to be competitive, to win. While you might argue that team sports accent teamwork, what they mostly do is reward the unquestioning following of other people's rules, often disguised as tradition and mores. A competitor strives for black-or-white resolution. Taken to its extreme, competition excuses violence, destruction and atrocity. To view the world as friend or foe leads to paralyzing despair if the foe is seen as incomprehensible, implacable, and too diffuse to hit solidly.

The second force that engenders the feeling of individual impotence is the strongly encouraged focus on vocational specialty or "discipline," a term used to identify what's required for acceptance, license, or admission to the club (team). But a Ph.D. all too often indicates a history of ritualized obedience rather than of exploration. A kind of intellectual "monocropping" — planting all your land to one crop — is thus encouraged. As in agriculture, this unnatural concentration reduces diversity and disrupts evolution. It is also vulnerable to disruption arriving from an unexpected quarter, a common failing of all technology.

"Unexpected" implies a lack of awareness, which in turn indicates a lack of knowledge — the consequence of an incomplete education. A person trained in a discipline — an "expert" — is unlikely to have the wide view needed to integrate the expertise into a larger system, especially the ultra-complexities of ecology and environment. Training — a good word for a one-track mind — is only one aspect of a true education.

Specialization also invites oversimplification. You can be sure that a simple solution to any problem has left out something important. Beware (be-aware) whenever you hear a statement beginning with the phrase, "All we need to do is . . .". Note also that those proposers rarely include themselves as committed actors exposed to all aspects of the project.

Because the narrow-visioned thinking of specialists is well rewarded,

particularly in academia, pernicious effects are invisible to those involved. The need for interdisciplinary effort is usually considered as a theoretical matter for future discussion, impractical, or as a turf-invasion to be repelled by bureaucratic maneuver. This situation is a veritable petri dish for culturing dishonesty and ineptitude.

The third force affecting an individual's effectiveness is the intuitively sensible urge to work for security. Security can be defined as ensuring that the future will be to your personal advantage — another sort of "win." Our society condones the accompanying implication of selfishness.

Technology and Choice

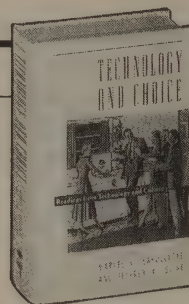
*These essays from past issues of **Technology and Culture** dance around the central questions of controlling technology past and present. Individually, they furnish useful insight on how we got into our current situation. Taken as a whole, the selections exemplify the intricacies involved — a good thing to keep in mind when proposing countermeasures.*

—J. Baldwin

• We can now ask to what extent popular beliefs about technology and housework are true. First, there is the popular assumption that technology has made housework easier. Certainly market services have eased some elements of work, and convenience foods may also have reduced fatigue. As for utilities, we can only surmise that, while they did reduce fatigue, their secondary effects created more and new forms of housework. None of the technologies increased general pleasantness of housework, made tasks interesting, or improved the sense of self-worth of the housewife.

Second, the popular belief that technology makes housework less expensive is not well supported. The impact of utilities on cost cannot be measured, while appliances and convenience foods are more expensive. Only market services appear to be potentially cheaper than work in the home, but this is contingent on placing an economic value on the homemakers' labor.

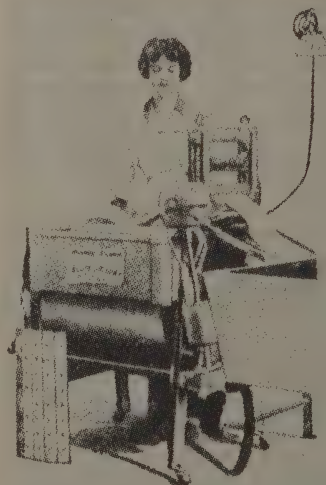
Third is the time factor, for which popular belief would lead us to expect a decrease. However, we find that if time is saved by some technological means, the saving is offset by concomitant activities and by maintaining the new technological systems. In the past, the most significant factors contributing to saving time in meal preparation were nontechnological, such as smaller families and the increased labor-force participation of women. Now, real savings can be realized primarily by removal of this activity from the home.



Technology and Choice

Marcel C. LaFollette and Jeffrey K. Stine, Editors. 1991; 341 pp.

\$16.95 (\$18.95 postpaid) from University of Chicago Press, 11030 S. Langley Ave., Chicago, IL 60628; 800/621-2736 (or Whole Earth Access)



Finally, popular belief has it that technology has made for less housework and thus for a redistribution of household labor among household members. However, the evidence (as opposed to anecdotes) indicates that household specialization of labor probably has not changed over time and may actually have become more burdensome to women.

"Good old New England individualism" — long considered a traditional American value — may be translated as "I've got mine, and you can go to hell." This is not systemic thinking. It is not a useful mindset for a designer who needs to realize that true security is not to be had for anyone until all people live well, in a just and ecologically sustainable society.

Security-seeking also encourages activity that is safe (proven), or that gives a safe feeling or image. There is a terrible tendency to attain a physically and psychologically secure position of some sort, and then to expend most of

your energy defending it. Conserve-ative politics has its basis here. Security and its accompanying conservative stance is the exact opposite of innovation, yet innovation is clearly required if we are to extricate our society from the threatening situation now at hand.

All three phenomena examined above are rooted in the fear that there is not enough — of anything — to go around, when in fact there is plenty for all. The three working in concert (perhaps in a negative synergy) can cause otherwise intelligent people of benign intent to seek extreme positions. Frustrated people are easily deflected into zeal-

Technology and Culture

This is where people interested in technology and its effects on various cultures do battle. The tone is generally academic — not surprising in the quarterly publication of the august and slightly arcane Society for the History of Technology. Papers attend the history, development and philosophy of technology from megaview to angels-on-a-pinhead detail. There are extensive book reviews. Some dry bones here and there, but some offerings are from intrepid critics — a few with metaphorical grease on their hands — attempting to untangle the vexing questions that most investigators ignore, dismiss, politicize, or get wrong. There are gems to be found. Among them you'll encounter the frontier, which is what we came for. Good reading for techno-twits, -crats, and -phobes.

—J. Baldwin

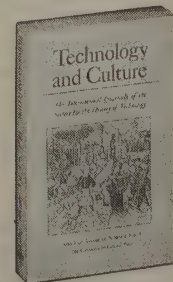


A construction scene, dating about 1250, showing both a stretcher and a wagon-type wheelbarrow being used. The strap across the porter's shoulders reduces the load on his arms.

When the outstanding statistical inquiry *Consumers' Incomes in the United States: Their Distribution in 1935-36* appeared, it confirmed the skewed income distribution by revealing that over two-thirds of American families received less than \$1,500 per year and that most of them could barely buy necessities. Moreover, it confirmed Douglas's notion that redistributive policies would be reflationary. It outlined a number of hypothetical schemes in which income distribution in the United States was less unequal and the lower-bracket groups (whose propensity to consume was higher) were earning a larger share of the national income. In each case, a much larger amount of consumer goods would be purchased.

World War I caused the first energy crisis in Finland. The importation of coal slumped radically, and the supply of lamp oil (paraffin) gradually dried up. The scarcity of foodstuffs, combined with price regulation and rationing, precipitated the rise of a black market. Rumors about exhausted

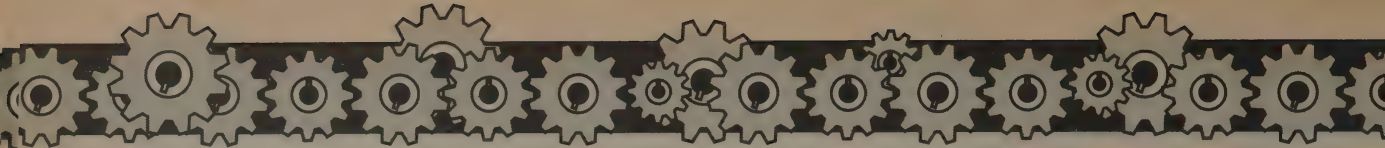
supplies of food and other necessities increased anxiety in the country. People were afraid that the supply of candles and matches would be depleted. The shortage of fuels and wartime inflation turned electricity into an unbeatable source of light. It did not vanish from the legal market like many other necessities because of hoarding and speculation; electricity could be generated continuously by means of indigenous energy sources (hydropower, firewood, and wood wastes). Owing to price regulation, electricity rates were not affected by the soaring inflation. As a result, in the areas that were wired, electricity became the cheapest and most reliable source of light within a few years. . . . In the so-called electrification frenzy (*sahkoistysvimma*), people neglected to consider technological expertise and economic profitability. The lack of equipment made the situation still worse. Distribution networks were sometimes built so hastily that barbed wire was used for overhead lines and bottlenecks for insulators.



Technology and Culture

Robert C. Post, Editor.

\$27.50/year (4 issues; subscription includes membership in the Society for the History of Technology) from University of Chicago Press/Journals Division, P. O. Box 37005, Chicago, IL 60637



otry, but most often they give up, viewing their world with what the Japanese call “dead fish eyes.”

But designers need not despair, at least not yet. They are in a better position than most to do better, even if temporarily trapped as indentured servants. There is a new breed coming into power. They are their own clients, getting on with the work that obviously must be done, as the old farts get in their last poots. The sharpest have already recognized that better security can be had by designing for a preferred future, rather than defending a structurally flawed status quo. Well-educated generalist-designers know that they always have nature as a co-client who ultimately requires a sustainable strategy.

They think systemically. They work from principle, designing *with* nature rather than opposing her, taking special care not to induce subtle “repetitive injury syndrome.” They seek and take advantage of *synergy* — strategies in which the whole becomes greater than the sum of the parts. They insist upon maximum efficiency. Waste is always unprofitable, and is embarrassingly inelegant and stupid. Pollution is usually a good measure of inefficiency. It’s best stopped at the source, eliminating later, more expensive cleanup problems.

The new designers also realize that corporate mistreaters of people and environment need to be won over, not destroyed. Honestly now, would you rejoice if oil companies quit making fuel? Do you really want to live without

steel — to use a stone axe? Designers must learn to employ education and negotiation skills and cooperative effort as an integral part of their practice. That’s often called leadership.

If you hunger for immediate results, try initiating or joining a proof-of-concept effort, a demonstration of better ways and, of course, your skill. (Be sure it’s real and not some damned simulation!) The people involved will probably include lots of students — in any case, you’ll all be learning fast. You must be prepared to live in and with your work. That’s a wonderful spur to clear thought, and the only way to experience the consequences of your decisions — to literally know what you are doing.*

The more patient can begin acting worldwide on what can be widely agreed upon right now, a start toward evolving *Homo technus* through the transition from the present cruel, wastrel-effete stage into one that is in tune with the requirements of a sustainable civilization. That’s a big order, but people can and must take responsibility, at the very least for the hardware.

We’re actually talking a critical new profession here, one that Buckminster Fuller accurately named “Comprehensive Anticipatory Design Science.” It’s closer to applied ecology than applied technology. It’s a job for all of us. ☛

* This is what David Orr is attempting at Oberlin College (*Ecology* p. 123): remaking the school itself into an irrefutable working example of environmental rectitude.

Nothing to Fear

The simplest technology is dangerous in some way. So is living naked on an idyllic tropical isle. How to rationally assess and manage the risks of life is the subject of this collection of often provocative papers. Profits-firsters, Earth-Firsters and everyone in between will find plenty here to deplore, celebrate and deny hopefully. All will be made uncomfortable as their deepest beliefs are questioned. Sometimes creepy but always essential. That’s about all you could ask from a book. It’s the best I’ve seen on the subject. —J. Baldwin

The United States Public Health Service also played a central role in establishing the popular imagery associated with germ theories of disease. As the uniformed avant-garde in America’s fight against contagion, the Public Health Service, a branch of the military, created a literal association between the uniformed officer and the eradication of disease. In its role as hygienic gatekeeper at Ellis Island, the service further reinforced the connection between disease and immigration, and,

ultimately, between immigration and crime.

- If some agencies are willing, whether by law or by policy, to spend more per life saved than other agencies, then our risk budget is misallocated. We are spending more money to save fewer lives than we could if we were less selectively cautious. Worse still, if we tried generally to achieve absolute safety or zero risk, we would probably achieve net negative effects by diverting resources away from pursuing other goods (like education or material comfort) that inadvertently improve our health and safety.

- Built into the flood insurance program is a significant section — 1362 — that involves relocation of families from persistent flood hazard areas. This, and the various provisions calling for mapping and rezoning of hazardous areas, made the National Flood Insurance Program the nation’s first land use control law.

- At an earthquake preparedness meeting in

Little Rock, Arkansas, in 1983, the emergency managers of the State of Kentucky and of Memphis agreed that any immediate attempt to get support for earthquake hazard zoning and retrofitting of seismic risk buildings would receive little political support; they worried that if such an effort were begun at that time, the whole cause of earthquake preparedness in the Mississippi Valley would be actually set back. But they agreed that they could start raising a new generation of voters who would be knowledgeable about earthquake risks and who would eventually pressure their representatives to do what needs to be done.

- Unlike disaster research and natural hazard research — both of which inform the work of public bodies, but are mainly carried on by academics — risk analysis practices are being systematically adopted by bureaucratic organizations. Several factors have combined to encourage its use as a procedure in public decision-making. Inquiries into spectacular disasters have turned up evidence of inadequate consideration of risks in existing technological

The Global Citizen

Having learned from the shortcomings revealed by critics of her famous but flawed *Limits to Growth* (it was too simple à view), Donella Meadows has turned into an essayist with an uncanny ability to cut through the ignorance and politics surrounding the more recalcitrant issues of our day. Many of the essays address matters all too familiar to readers of this magazine, but certainly not in the same old way. Her analyses clear the air, make you see what's important and what's really going on. She gives you a firm base from which to act. You may disagree, but at least you'll know.

—J. Baldwin

- Upper-class people never clean up after themselves or care for the physical needs of others. They consider their time too important to spend that way.
- Middle-class people clean up after and care for themselves and a few others in reciprocal arrangements — I'll do your laundry if you'll shovel the snow — and they consider themselves just ordinary folks.
- Lower-class people clean up after themselves and others all day, every day, and figure that's all they're good for.

Gatherings of conservationists these days are almost unrecognizable because the language is that of international banking and the sums are in the millions of dollars. But everyone knows that the nuts-and-bolts

economic talk is actually about something beyond price. A Nature Conservancy brochure lays out what the real deal is. It says: Just \$300 for each hectare (2.5 acres) of Guanacaste National Park "buys you all of (forever): 0.001 jaguar, 0.5 parrot, 20 toads, 25 spiny pocket mice, 0.04 anteater, 100 vines, 0.03 spider monkey, 400 dung beetles, 0.01 muscovy duck, 0.00029 volcano. All purchases will be held for your on-site inspection by the Costa Rican National Park Service."

• How could a farm bill be written to guarantee the survival of the family farm?

Well, to begin, it ought to have that as its goal. The main problem with our current farm policy is that it has too many goals. We are trying to make farm prices high for the farmer but low for the consumer, to produce all we can for export but reduce surpluses, to render humanitarian food aid but use food as a foreign policy weapon, to conserve farmland but make it produce more and more, to encourage young farmers but weed out inefficient ones, to stabilize prices but allow the market system to work, to appease special interests and get the administration reelected, and, oh yes, to feed people.

Unless we sort out these goals, our farm policy will continue to be chaotic. . . .

If we could bail out Chrysler, we can bail out the people who feed us.

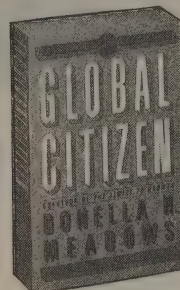
• To a "developer," the land is worth at least \$1,000 an acre, cash down, much more for an acre near an intersection or by a lake or with a view. It is worth that only once.

From then on the economics of the land are changed. There may be utility for a homeowner, income from a shopping mall, revenues for a town. The money flow is greater, but that value no longer comes from the land. It comes from high-cost inputs — construction and maintenance, energy, labor, sewers, trash collection — all of which draw resources from land somewhere else.

If we let the market guide "development," we lose sight of most of the value of the land. The market sees only the one-time big profit of the "developer." It discounts the modest perpetual income of the farmer. It ignores the beauty for each bypasser. The market does not value the groundwater, does not foresee the flood, and does not take into account future taxes for sewers and schools.

To include and protect all kinds of land value, something has to be added to the market, something that expresses the long-term public interest. . . .

New Hampshire, for example, has a small fund to buy development rights to farmland. The farmer who sells those rights



The Global Citizen

Donella H. Meadows, 1991; 300 pp.

\$14.95 (\$17.95 postpaid) from Island Press, Box 7, Covelo, CA 95428; 800/828-1302 (or Whole Earth Access)

continues to own the land, manages it, lives on it, earns money from farming and logging it, and can sell it. But the deed is restricted so that no owner, now or in the future, ever can "develop" it. The state acquires only one right in the deal — the right to enforce that restriction.

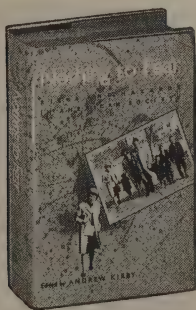
• The government can't help lying about nuclear matters. It operates according to the basic bureaucratic rules of information blurring. Use long, vague words. Never admit a mistake. When embarking on something new, pretend you are far more certain than you really are. The path of nuclear power is especially littered with lies because the technical nature of the undertaking encourages long words, necessitates many mistakes, and involves awesome levels of uncertainty. . . .

The storage of nuclear wastes is a super-human job, and governments are only too human. This stage in the development of nuclear power, like all the stages before it, will be trial and error, error, error.

Who should be exposed to the error? The government's answer is "as few people as possible, therefore we should go to the boondocks." Out here in the boondocks, we favor another answer. "Those who make the decisions should bear the risks."

Why not, indeed, leave the wastes above-ground where those who generate them can watch over them day and night? There's a five-sided space inside the Pentagon that would be just dandy for the wastes from bomb making. Wastes produced by DOE research programs would fit nicely in the courtyard of DOE's Forrestal Building, right there in downtown Washington.

systems: a recent report on the space shuttle Challenger concluded that the U.S. space program places too much reliance on subjective judgments and too little on formal risk assessment methods.



Nothing to Fear

(Risks and Hazards in American Society) Andrew Kirby, Editor. 1990; 301 pp.

\$29.95 (\$31.95 postpaid) from University of Arizona Press, 1230 North Park Ave. #102, Tucson, AZ 85719; 602/621-1441 (or Whole Earth Access)

Winning The Peace

B

Y HIS ACTIONS in recent months, Saddam Hussein has proved to the world that he is a malevolent man. (The Kurds on whom he dropped poison gas, of course, knew this years ago.) But the U.S.' willingness to confront Iraq hardly sprang just from an altruistic desire to liberate Kuwait: a half-million troops would not have been sent if Kuwait merely grew broccoli.

This has been cast as a war between good and evil, but it was also a war about oil — who controls it and how much it will cost. It was both a moral war and a resource war; a war against Hussein and a war for energy. After the war, the energy issues remain. Will this war strengthen America's resolve to reduce its dependence on foreign oil? Or will it, ironically, have the opposite effect? Having won the war, can we win the peace?

For decades, one of the veiled, unstated principles of U.S. energy policy has been: "Maintain access to Middle Eastern oil, regardless of economic, environmental, political, or military costs." But as this war demonstrated, the true costs of a barrel of Persian Gulf crude are far larger than its nominal price. Since this is unlikely to change, it seems reasonable to ask: in the decades to come, are our strategic and economic interests best served by preserving access to Persian Gulf oil — or by eliminating our need for it? Whatever the rationales for this war, we don't need to depend on oil from the Gulf — and it's cheaper not to.

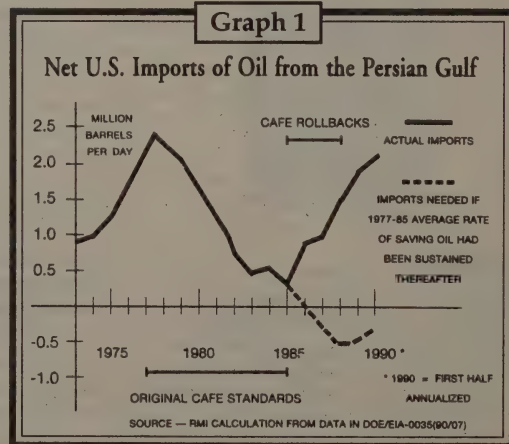
More simply, did we put our kids in tanks because we didn't put them in efficient cars? The answer is yes. Americans wouldn't have needed *any* oil from the Persian Gulf after 1985 if we'd simply kept on saving oil as quickly as we did for the previous nine years (graph 1).

Even now, we could still roll back the oil dependence that perpetually holds our foreign policy hostage and distorts other U.S. priorities in the Middle East. We could eliminate all Gulf imports by using only an eighth less oil.

For example, improving America's 19-mile-per-gallon household-vehicle fleet (graph 2) by three miles per gallon would replace U.S. imports of oil from Iraq and Kuwait. Another nine miles per gallon would end the need for any oil from the Persian Gulf and, according to the Department of Energy, would cut the cost of driving to well below pre-war levels without sacrificing performance.

The New York Times published a slightly different version of this piece six weeks before the Gulf War broke out. Amory and Hunter Lovins are the founders of the respected and sassy Rocky Mountain Institute.
—J. Baldwin

Graph 1



BY AMORY B. LOVINS
AND HUNTER L. LOVINS

The Reagan Administration doubled 1985 oil imports from the Gulf when it rolled back light-vehicle efficiency standards. Today's new cars average 29 miles per gallon. Yet ten manufacturers have built and tested attractive, low-pollution prototype cars that get 67 to 138 miles per gallon. Better design and stronger materials make some of these safer than today's cars, as well as more nimble and peppy.

And efficiency needn't mean smallness: only 4 percent of past car-efficiency gains came from downsizing. Some of the prototype cars comfortably hold four or five passengers, and two of them are said to cost nothing extra to build.

Many other oil savings can help. Boeing's new 777 jet will use about half the fuel per seat of a 727. Technical refinements can save most of the fuel used by heavy trucks, buses, ships, and industry. Insulation, weatherstripping, and simple hot-water savings can displace most of the oil used in buildings. Superwindows that retain heat in winter and reject it in summer could save each year up to twice as much fuel as we get from Alaska.

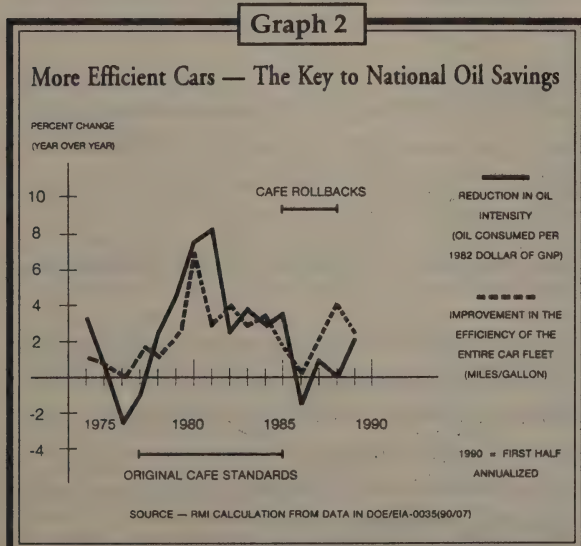
In all, we know how to run the present U.S. economy on one-fifth the oil we are now using, and the cost of saving each barrel would be less than \$5. Even achieving just 15 percent of that potential oil saving would displace all the oil we've been importing from the Gulf. Doing that requires only a small additional step. Since 1973, we've reduced our oil use per dollar of gross national product four and a half times as much as we'd need to reduce it today in order to eliminate all Gulf imports.

How can we promote fuel efficiency? Higher gasoline taxes are a weak incentive to buy an efficient car, because gasoline costs five times less than the non-fuel costs of owning and

running a car. And since the often higher purchase price of an efficient car roughly cancels out the lower gasoline bills, the total cost per mile for 20- and 60-mile-per-gallon cars is about the same.

But the 40-mile-per-gallon difference, for cars and light trucks, represents more than twice America's imports from the Gulf. If the security and environmental costs of inefficient cars had to

*Did we
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The answer
is yes.*



Despite
military vic-
tories, if we
continue on
our present
energy course,
no good long-
term outcome
— in dollars,
oil, or blood
— is in sight.

be paid up front, buyers would choose more wisely. The best way is "feebates": when you register a new car, you pay a fee or get a rebate; which and how big depends on its efficiency. The fees pay for the rebates.

Rebates for efficient cars should ideally be based on the difference in efficiency between your new car and the old one — which you'd scrap, thus getting the most inefficient, dirtiest cars off the road first. That's good for Detroit, for the poor (who disproportionately own such cars and served in the Gulf forces), for the environment, and for displacing Gulf oil sooner.

The California legislature recently approved car feebates by a margin of seven to one (outgoing governor George Deukmejian vetoed the bill, but his successor, Pete Wilson, is expected to sign it later this year). Connecticut, Iowa, Massachusetts, and several other states are weighing feebates. Feebates are also being considered for new buildings in California, Massachusetts, Iowa, and the four northwest states, and could be applied to trucks, aircraft, appliances, and other energy-consuming goods. Unlike miles-per-gallon standards, feebates reward maximum performance and encourage businesses to bring superefficient models to market quickly. Standards *plus* feebates are better still.

Energy efficiency is also the key to the decades-long transition to nondepleting, uninterrupted energy sources. Government studies confirm that sun, wind, water, geothermal heat, and farm and forestry wastes can cost-effectively provide, within forty years, 50 to 70 percent as much energy as America uses today. Efficiency would raise that share and buy the time needed for graceful conversion.

As we have seen in recent months, the military alternative to efficiency isn't cheap. Gulf jitters added more than \$40 billion a year to U.S. oil imports. Counting military costs, Gulf oil in late 1990 cost over \$100 a barrel.

The more than \$20 billion net cost of U.S. forces in the Gulf just from August through December 1990, if spent instead on efficient use of oil, could displace all the oil now imported from the Gulf. It could also create jobs and wealth, improve America's trade balance, stretch domestic reserves, clean urban air, cut acid rain and global warming, and help the poor at home and abroad.

In 1989, the Pentagon used about 38 percent as much oil as the U.S. imported from Saudi Arabia, and estimated that its consumption would double or triple in a war. An M-1 tank gets 0.58 miles per gallon. An oil-fired aircraft carrier gets 17 feet per gallon. Despite military victories, if we continue on our present energy course, no good long-term outcome — in dollars, oil, or blood — is in sight.

From inside an efficient car, however, the Gulf looks very different. From inside enough of them, its oil becomes irrelevant.

If, each year for the next ten, America invested as much money in energy efficiency as it spent each week waging the Gulf war, by the turn of the century we would be well on our way to achieving sustainable energy independence — something we have not had for the past twenty-five years. National security, peacetime jobs in a competitive economy, and the environment demand immediate mobilization — not of tanks but of efficient cars, not of B-52s but of 777s, and not of naval guns but of caulking guns. ♻️

Practical Home Energy Savings

The hardworking Rocky Mountain Institute saves some of their own energy in this nifty book — read it and you won't pester them with your questions. It's all comprehensive, current, reliable information and hardware sources, served in a manner that makes it exceptionally easy to use. If *PHES* seems familiar, look again: this must be the only save-energy book in print that's witty — actually amusing enough to be read without falling out of your chair from boredom. Use *PHES* with *Resource-Efficient Housing* (Ecolog p. 56); you'll be the first on your block to know all about it.

—J. Baldwin

Expanding foam is great for filling large voids. Foam comes in aerosol cans and takes about fifteen minutes to cure. You'll want to wear your grubbier work clothes when you use this stuff. It's messy, and you'll need to scramble around under the house and in a dusty attic. A little "spritzer" bottle that sprays a water mist will let you stop the surface of the foam from being sticky; otherwise, if you touch it, you wear it. Foil-Ray™ or any other foil-faced bubble wrap (available at the local hardware store) attached with silicone caulk is great for sealing gaps too wide for foam. For really big holes, cut sections of rigid foam insulation to fit and glue into place with expanding foam. (Be careful not to get insulation dust or crumbs in your eye.)

Plant trees or build a trellis to block out solar radiation. Basically, by planting trees, you're changing the climate around your house to reduce energy costs. Deciduous (leaf-bearing) trees planted to the south, east, and west of your building provide valuable shade. In fact, one mature tree provides as much cooling as five mid-sized air conditioners. Deciduous trees block summer sun but drop their leaves to allow the winter sun's heat to warm you on those cold, clear winter days. Evergreens planted to the north and east of your home will shield you from winter winds and lighten the load on your furnace. Don't ask about payback period on this one, but doing it will make you feel good, and you'll get an A+ for long-range vision.

Refrigerator Parables

Remember the pre-World War II refrigerators with the motors on top? Those motors were close to 90% efficient. By the 1970s refrigerator motors were more like 60% efficient. They were also located underneath the fridge, so the heat rose to where the food is. Thus, with the blessings of modern technology, some refrigerators still in service can spend half their effort cooling the heat of their own motors!

Over the years, manufacturers have also been trying to make the inside of the refrigerator bigger without making the outside bigger. (Given time, they might have

had the inside bigger than the outside.) What they did, of course, was to skimp on the insulation, so outside heat comes straight in through the walls. They also designed the refrigerator so that when you open the door, the cold air falls out and the refrigerator frosts up inside. Most refrigerators, therefore, have electric heaters inside them to melt the frost. Many also have electric strip heaters around the door to keep the gaskets from sticking. Some even have electric heaters in their outer skin to keep humidity from condensing on it. You can try if you like, but it's hard to come up with a dumber way of using electricity.

Fortunately, there are smarter ways to build refrigerators. From 1950 to 1975, the electricity it takes to run a typical refrigerator for one year nearly tripled to 1,800 kW-h. Then, in 1976, California passed a law prohibiting the sale of refrigerators that used more than about 1,400 kW-h. Within four years, virtually every refrigerator on the market met that standard, and the best — by Amana — did a third better. Now, federal law caps the typical unit at 940 kW-h. The best automatic defrost models use 770 kW-h. In 1993, the law will lower the cap to 670 kW-h. Meanwhile, a small firm in California sells handmade units that cost more but use only 240 kW-h for a full-sized unit. (See the *Real Goods Catalog*, listed in the Appendix, for further information on this model.)

"Why should I insulate an apartment I'll live in for six months, max?" We hear it again and again: "But I rent!" Of course you're not going to use your next paycheck to put wall insulation or storm windows into the apartment your landlord owns. But ask yourself who's paying the utility bills and who has to live with the drafts and the frost on the *inside* of the window. Inefficient and wasteful housing hurts you too. If the landlord buys the cheapest refrigerator available, which is likely to be the least efficient, do you have to pay the electrical bills ever after? *Break the cycle.* You do have a stake in efficient housing. So does your landlord, who'll find it easier to rent a cozier, energy-efficient apartment.

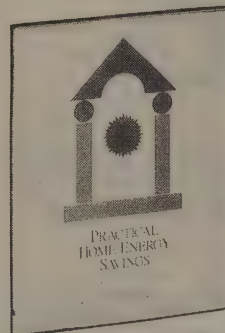
A number of our recommendations have such a rapid payback (the time it takes for your savings to equal your investment in efficiency) that you should do them regardless of your landlord's support. Caulk, weatherstrip, wrap your hot water tank, and install a water-efficient showerhead. These inexpensive solutions offer such enormous energy savings that you'll come out ahead even if you live there for just one winter. And don't forget — you can pack up and take the water-efficient showerhead and efficient lights with you when you move.

Ask your State Energy Office, your utility, or your state's Department of Social Services if there are programs to help improve the efficiency of your apartment. Involve

Practical Home Energy Savings

David Bill, 1991; 47 pp.

\$8 postpaid from Rocky Mountain Institute, 1739 Snowmass Creek Road, Snowmass, CO 81654-9199



your landlord too. A landlord may be willing to pay you by the hour, or at least to buy the materials, so you can carry out the measures in this book. And when your refrigerator or furnace dies, see that he or she buys an efficient model. It's worth it for both of you.

Residential windows with an R-value of 6 to 8 (measured at the center of the glass) are now readily available. (Custom-made windows are available with even better insulating qualities.) Superinsulating windows will actually gain more heat than they lose — even on the north side of the home. In fact, an R-6 "superinsulating window" can outperform an R-19 insulated wall because of the solar heat gain in most climates; R-7 does this in virtually any climate. . . .

A couple of manufacturers of "superwindows" are Hurd Millwork, 575 S. Whelen Ave., Medford WI 54451, (715) 748-2011, and Alpen, 5400 Spine Rd., Boulder CO 80301, (303) 530-1150.

The U.S. wastes over \$300 billion every year due to lack of insulation, inefficient refrigerators, drafty doors, and other energy leaks in buildings, industry, and transportation. That's more than the entire U.S. military budget.

Include bathroom exhaust fans and vapor barriers as part of your insulation and draft control. Moisture degrades the performance of insulation, encourages the growth of unhealthy fungi and molds, and increases the danger of rot in wood. Moisture control becomes more important as your home becomes better sealed against air leaks. To remove the moisture before it becomes a problem, use bathroom and kitchen exhaust fans.



Beauty & The Junkyard

BY IVAN ILLICH



EXICO CITY PRESENTS THE WORLD with a new, modern plague. Salmonella and amoebas are now routinely transmitted through the respiratory tracts of people living there. When I arrive at the high valley of Tenochtitlán (8,000 feet above sea level), surrounded by mountains, I struggle to breathe the thin air, the atmosphere heavily polluted by an especially high-particle-density smog.

In four decades the city grew from one million to over twenty million people. The one experience shared by most newcomers before their arrival was nearly unlimited open space. Today, between four and five million people lack any special place to deposit their daily stool, urine and blood. And the general population of the city does not possess toilet habits appropriate to a densely populated habitat, habits which immigrants to Calcutta or Cairo bring with them to the city. Mexican concepts of cleanliness have never been shaped by the constraining ideal of Hindu, Muslim or Confucian disciplines.

Further, Mexican leadership remains singularly blind to the matter. The Western prejudice against bowel movements unless one sits over water with paper at hand is endemic among the Mexican elite. Mentally, middle-class Mexicans live in a complex nation where a temporary economic crisis has cut the flow of dollars and water. The illusion of living in a crisis, and the habit of flushing a toilet, pushed the body waste of more than four million of their other neighbors out of sight for most professionals.

Ivan Illich asks questions that shake the ground most of us think we stand on. His historical investigation of the commons, and of the self-reliant communities that evolve from it, cast our technological society — based on scarcity — in a new light.

*Illich's collaborative "Declaration on Soil" appeared in our Summer 1991 issue. Versions of "Beauty & The Junkyard" have appeared in England, in *Fourth World Review* and *The Guardian*. It will be included in Illich's next book, *In the Mirror of the Past*, a collection of his lectures over the last decade or so, to be published by Marion Boyars (New York) and distributed by Rizzoli International (New York).*

—Richard Nilsen



Then the earthquake of September 1985 shook the capital. One out of ten professionals, accustomed to living with a WC, could not flush for a week or more. For the first time, some public voices began to wonder whether hygiene inevitably meant the dilution of feces and the increase of black water. What should have been obvious long ago suddenly became evident to a few: to provide water for millions of toilets is beyond the economic power of Mexico, whatever timespan was set. And even if there were enough money and a more rational use of flush technology, the attempt to pump sufficient water to operate the city's toilets would destroy the semi-arid agriculture practiced within a radius of several hundred miles. Further, the amalgamation of potentially fertile feces with barely degradable waste — characteristic of modern sewer systems — would poison rather than enrich the fragile topsoil built up over centuries in the plots surrounding the city at lower altitudes.

A small but potentially influential number of people saw their image of the city broken by the earthquake. It still has not touched the smugness of the country's officialdom, but it did shake people who are able to look at their hitherto-unexamined certainties about the nature of waste and the very character of the megalopolis as the producer of economic value.

In many parts of the world today, cities are seen as sources of wealth and rural areas as the retreat of a privileged few, but, on the whole, as an economic "problem." The rural economy of the United States may be the best current example. But where does urban wealth come from? Every schoolboy can answer: the economy. Fine. But what *is* the economy?

I was helped in my understanding of this question by my reading of Karl Polanyi. He was instructed by Aristotle. The *Politics* had been read by Greek, Arabic, and Latin scholars for over two thousand years. The great modern European commentaries had long been written. But no interpreter had taken Aristotle at his word. They seemed to believe that he was either sneering at merchants or joking about them, speaking with tongue in cheek.

Aristotle observed something new and unheard-of in Athens. Some citizen merchants were using a previously unknown technique when they offered their goods in the market. Instead of selling these goods at cost plus profit, or keeping to the values established by treaty with a foreign supplier, these innovators let the price vary according to offer and demand. Aristotle was fascinated that such a transaction could

take place and wondered how it worked. Polanyi was the first to recognize this.

He assembled a team of historians at Columbia University. Each studied a different society, trying to discover when prices first began to move according to supply and demand in ordinary times. All of them reported the same finding. The replacement of simple trade by this marketing technique, though practiced occasionally while being generally legally proscribed, was not part of the ordinary social life in any ancient society. Further, such an arrangement only became the form of common behavior at the time of Aristotle and after.

Here I began to see the first lineaments of what is today called the economy — a system resting on scarcity.

History of Disvalue

No wonder Aristotle was surprised. Up to this historical moment, the management of the goods necessary for everyday life in the city was nowhere structured in terms of scarcity. In fact, societies were generally so arranged that the experience of scarcity could not emerge.

Back, then, to our question. Wealth is believed to come from the economy. But I have come to suspect that the primary product of the economy is waste. To understand both this statement and the situation of Mexico City, I suggest the use of the term "disvalue." What we need, precisely, is a *history* of disvalue. I choose this concept in order to emphasize its direct relation to economics. But it means something quite other than price, cost or economic loss. I strongly suspect that the social creation of disvalue is the necessary condition for the recognition and acceptance of, and desire for, mass products as valuable. Disvalue is necessarily related to a certain kind of economics because it makes such an economics possible. Modern economics presupposes the devaluation of culturally determined patterns of behavior. The mass production of goods, services, and images demands cultural blight through the spread of disvalue throughout the society. The necessary matrix for the accumulation of economic value, the very character of a successful modern society, is the principled devaluation of traditional cultures.



I want to make it clear, however, that I am not speaking about some kind of entropy. When I speak about disvalue, I refer to a historical, social ideal which may be the source of the fact that modern society has transformed the Earth from an open, breath-

ing space into a stinking junkyard.

Disvalue is not just a modern term for an age-old perception variously named as evil, the devil, guilt, or exploitation. What I talk about is new — the social program of degrading the cultural patterns through which people have traditionally found joy and meaning in the name of a reified ideal called development. By disvalue I mean something historical. The concept of disvalue provides me with a tool to study the break between economics under the conditions of a commons and under the conditions of scarcity management.

Waste is something more and other than an unwanted side effect of the economy, a kind of social analog to entropy. Waste is a disvalue, the condition that makes

**The expansion of
economic relations into ever more
aspects of everyday
life does not produce values;
rather, it concentrates
privilege.**

modern forms of production possible. It has a history that cries out for study. Such a history would reveal that waste is not a natural consequence of all cultural action. It is false to assume that all cultures had some kind of concept of waste, and that some were more successful than others in its management.

The history of disvalue appears the moment one discovers value. But this fact is completely obscured if one approaches economic history as a story of progress. Progress conventionally means the accu-

mulation of wealth. The development of productive capacity, the multiplication of trained workers, the growth of savings are seen as proof of this statement. More people, it is claimed, get more goods and services in the *modern* world. With simplistic assurance, economists tell us that the economy is a kind of machine that generates values. And for well over three generations, this naive assumption has been shared in a vulgar way by most people.

Concentration of Privilege

Now it begins to sound hollow. People suspect that the expansion of economic relations into ever more aspects of everyday life does not in fact produce values but, rather, concentrates privilege. And this privilege, which only a higher income can buy, is principally an escape from the disvalue that more and more affects the lives of all. Increasingly, disvalues appear as the principal output of the economy, and the production of goods and services as the means to prevent being injured by these disvalues.

Until quite recently, the cultural changes that come with enrichment were seen as a necessary condition for human wellbeing. Needs seemed to arise. The economy transformed them into demands for commodities. And so the motor for more and more production was kept running. Some began to see that most people then came to depend on something historically new — commodities were a special type of good. And, by social definition, they were scarce. Human beings came to be seen as needy, and society was a collection of needy people. Now we see that these cultural changes are a devaluation of self-sufficiency. Greater demand really means that people are more needy. Slowly, we begin to see that the progressive devaluation of culture, the environment and the human person is the driving force of economic production.

We no longer identify economic growth with improvement in the human condition. Disvalues loom larger than the highly advertised benefits of the industrial age. First, the unwanted side effects of production came to be recognized as externalities. We have learned something about the cost of these externalities, about the social price of many products. And as societies experience greater progress, so more refined heights of privilege are created.

We now see that many unwanted and harmful side effects can be measured, but not internalized in the



cost of the product. In many ways, enrichment means the colonization of the future—to bequeath a stinking junkyard to our children. The damages done by increasing consumption necessarily entail a depleted, degraded and poisoned world.

In the 1960s, we recognized these externalities. In the next two decades we came to discover counterproductivity. Our major modern institutions, in their very character, exercise a paradoxical power: they prevent most of their clients from reaching the very goals for which they were originally designed and financed. In the sixties, this observation was taken as a joke. In the nineties, it is sheepishly and quietly taken for granted. Schools cannot but degrade more people than they enfranchise; health care cannot but create a more terrifying range of suffering and despair; the acceleration of transportation cannot but make movement ever more time-consuming for the great majority.

How to explain these phenomena? How to understand these costs? How to accept the public's acquiescence? We can begin to answer these questions by bringing to light a new underlying principle that our major institutions and their accompanying legal framework have assumed. They now operate with a new kind of monopoly — what I call radical monopoly.

Earth Wisdom

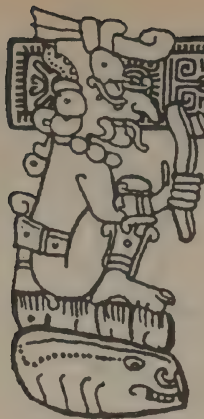
We usually understand monopoly as a situation where one firm corners the market to the exclusion of all others. Such commercial monopoly is often forbidden by law. In the United States, for example, one carrier cannot take over all the air routes of the country. A second kind of monopoly reaches much deeper. In Southern California, major auto manufacturers bought up public transportation systems in an attempt to promote the private automobile as the only effective means of transit. This is a technological monopoly. At a third level, one can discern something more far-reaching, a radical monopoly. Here, for example, motorized transportation excludes the use of feet. Through such means as propaganda, the imposition of controlling metaphors, the legitimization and sacralization of one institutional response, our major institutions seek to impose this kind of monopoly on society. This is the monopoly of wheels over feet, of schools over other forms of learning, of the magico-technological treatment of sickness over all tradi-

tional ways of responding to debility, suffering and death. And so on through the entire gamut of the goods, service and image sectors of the economy. Radical monopoly spreads its ever-growing tentacles in order to devalue the activities for which we do not need modern economic products, commodities. Finally, disvalue becomes a kind of velvet python, squeezing all life out of us. Eliot's hollow men now stalk the Earth, zombie-like creatures, plugged into a grand and sparkling array of technological wonders. A certain geo-sophical principle, an Earth wisdom, has been violated. Through a continual flow of the

**Modern economics
presupposes the devaluation
of culturally determined
patterns of behavior.
The mass production of goods,
services, and images
demands cultural blight
through the spread of
disvalue throughout
the society.**

water cycle through the atmosphere, the topsoil and human culture, the earth lives in a kind of open system. Now we see that the contribution of culture is decisive for this system's life.

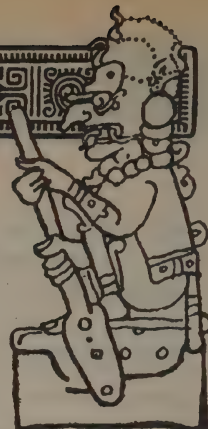
An essential condition for the flourishing and survival of any society is the task of protecting and enhancing the water-soil matrix of the environment. Western society, through the intensification and extension of disvalue, goes in the opposite direction. It grinds toward the inevitable destruction of this deli-



cate matrix. Mexico City is the very image of modernity, the microcosm of the West today. There, excreta, junk, poisons, waste heat cannot be transformed and radiated back into the cosmic cycle. The mythological possibilities of human cultivation are

smothered under the stinking blanket of a yellow-gray miasma. The Earth now evolves into a self-centered pile of trash where the accumulation of wastes extinguishes the rhythms of a living and breathing planet.

The course of this evolution has a history. At its heart is what we call economics. And one can trace the history of economic development in the West from the scarcity underlying Aristotle's traders through the destruction of autonomous cultural responses to the human condition, through the transformation of a lovely planet into a stinking junkyard, to the evisceration of the human comedy itself. The study of disvalue opens this puzzling history to our eyes. ♡

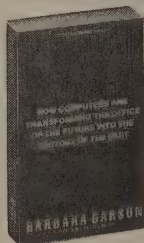


The Electronic Sweatshop

For many of us, computers are liberating, creative tools. But, as *The Electronic Sweatshop* amply documents, the dark Satanic mills of the twenty-first century may come with keyboards and cathode-ray tubes.

Computers can be misused for surveillance and for building privacy-busting dossiers (see "The Rise of the Computer State," *WER* #44, and "Privacy and Technology," on p. 90 of this issue), for dehumanizing the workplace (See *Processed World* review, *Signal* p. 193), and, as *The Electronic Sweatshop* points out, for monitoring worker productivity. Many data-entry companies regularly monitor "keystrokes per hour," a production pressure that increases cases of Repetitive Stress Syndrome. Machines for ensuring machinelike behavior on the part of human workers might be the shadow sides of technologies that extend human perception and augment human intellect. *The Electronic Sweatshop* is a wonderful, angry polemic that documents a neo-Dickensian subjugation of workers to technology. —Roger Karraker
[Suggested by Donna Hawley]

The common telephone dictation systems that link tape machines to typing pools also monitor executives. These systems yield performance records (volume, time and type of work) not only for the typist but for the "dictator." Dictaphone's *Mastermind* and Lanier's *Supervision IV* are two of the many dictation systems with executive monitoring features. Their basic surveillance purpose is indicated by their



The Electronic Sweatshop

Barbara Gerson, 1989; 288 pp.

\$9.95 (\$11.95 postpaid) from Penguin USA/Cash Sales, 120 Woodbine Street, Bergenfield, NJ 07621; 800/253-6476 (or Whole Earth Access)

names. Tower Systems International advertised the following features of an E-mail monitoring program actually named Surveillance:

- Reporting on all electronic mail messages sent and received
- Reporting on all electronic mail messages sent but not yet opened
- Reporting on all operator sign-on's and sign-off's
- Reporting a list of all attempted security violations, including information on the operator, the location and the time that the attempt took place

Some office doors are now opened by I.D. cards instead of keys. But every time an employee inserts his card to open the outer door, his office door, the supply room or even the bathroom, he also makes a record of the time he came in or went out.

Increasingly, salesmen and executives are

asked to put their schedules onto calendar forms in their management information systems. So far the only resistance I've observed is passive. Suddenly, no one can type. If pressed, salesmen keep two calendars, one on the machine and one in their jacket pocket, as routinely as they always kept two expense accounts.

An executive would still be shocked, I think, if his superiors claimed the right to go through his desk and check his appointment book. But riffling through screens seems to be emerging as acceptable business etiquette.

A U.S. Department of Labor publication estimated that in 1984 nearly two-thirds of the people who worked at video display terminals were monitored by their employers. In less than ten years, electronic surveillance has leaped from the factory into the office in a form that's frighteningly effective. Even Charlie Chaplin's *Modern Times* factory, with its corn-eating machine and its camera in the bathroom, didn't approach total surveillance. In our own "moderner" times, monitoring is not only total but it's fearfully cheap and easy. Once a worker is connected to the keyboard, he times himself.

I don't think we'll ever persuade management to give up electronic monitoring. I think we should outlaw it instead. Or at least ban *individual* monitoring, and restrict electronic monitoring to the collection of aggregate statistics. How we can enforce this ban — who will bell the cat — I can't say. But we can begin by recognizing this increasingly routine bit of programming as a serious invasion of privacy.

Art & Physics

Scientists think about the world in new ways. The equations or experiments that express scientific thoughts can trigger cultural revolutions, change nature itself. Artists see and hear the world in new ways, and the way they convey their transformed perceptions in grace notes or brushstrokes can help others experience a similar re-ordering of the senses through mimetic participation in the artist's vision. Science helps us understand how the world works. Art helps us interpret what reality means.

So goes the common wisdom.

Leonard Shlain, author of *Art & Physics*, makes a bold case, solidly researched and gracefully presented, that art has always been a powerful if unacknowledged driving force behind science, rather than sideline commentary. Shlain juxtaposes examples from the history of art with episodes from the history of science, and a pattern seems to emerge: the visionary breakthroughs of specific artists prepared everybody, including scientists, for the changes in thinking that scientists would introduce: "The artist, with little or no awareness of what is going on in the field of physics, manages to conjure up images and metaphors that are strikingly appropriate when superimposed upon the conceptual framework of the physicist's later revisions of our ideas about physical reality."

Throughout history, the way artists think about light, space, and time have set up a new mindset that led to the kinds of questions that led to scientific paradigm shifts. *Art & Physics* contrasts and compares Leonardo's theories with Newtonian mechanics, points out the parallels between Impressionism and quantum physics, and attempts to explain Monet's aesthetic mission and Einstein's intellectual framework in ways non-experts can understand.

This is not new territory. Cultural historians such as O. B. Hardison, and shelves full of French theorists, have pointed out that upheavals in art history over the past 500 years have always been intertwined with other cultural upheavals, particularly those caused by science and technology. It is one thing, however, to point out an intriguing but inconsequential relationship between artistic and scientific evolution, and quite another thing to insist that the process of art is integral to the progress of science, and furthermore that both ways of seeing the world are not only complementary but hardwired into human brains.

Shlain presents his evidence that artists have created symbolic languages that have changed history and inspired scientists to create new symbolic frameworks such as physics: "In the case of the visual

arts, in addition to illuminating, imitating, and interpreting reality, a few artists create a language of symbols for things for which there are yet to be words. Just as Sigmund Freud, in his *Civilization and Its Discontents*, compared the progress of a civilization's entire people to the development of a single individual, I propose that the radical innovations of art embody the preverbal stages of new concepts that will eventually change a civilization."

According to Shlain's case, the introduction of perspective into Western art by Giotto and Alberti prefigured the work of Galileo, and Leonardo DaVinci laid the groundwork for Newton. Manet's experiments with space and Monet's experiments with time were the initiation of a way of thinking that led to Einstein's theorems of spacetime. At the end of the book, Dr. Shlain directs attention to the idea that there is really no such thing as a primacy of art or physics, but each discipline, each way of apprehending the world we experience, is part of a complementary pair. Shlain makes a rational case for the value of the irrational, intuitive, affective parts of our own nature, and the worldviews that grow with them.

Ironically, those artistic radicals whose innovations seem to have inspired scientific breakthroughs were scorned by their contemporaries. Enumerating six characteristics of the special theory of relativity that challenged the foundations of common sense, Shlain claims: "As radical as all of these principles were, artists anticipated each and every one without any knowledge of this theory of science. With sibylline accuracy, revolutionary artists incorporated all these new perceptions of reality into the picture plane of their art. In my interpretation of art history, it was these very innovations that brought down upon their heads the scorn and ridicule of the public and critics alike, who could not know that they had been privileged to be the first to glimpse the shape of the future."

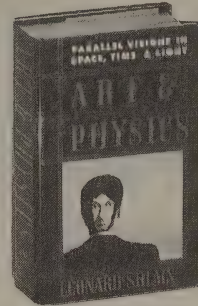
Is the world as we see it, or as we think it is? This issue was the crux of a two-thousand-year-old competition of ideas. Physics won. Philosophers and artists haven't gone away since Newton swept the field, but most people today agree that a cure for cancer or a doomsday weapon is more significant than a symphony or a sculpture. There's a black irony at the heart of physics' victory, and we all know what it is: new ways to think about the world have proven to be dangerous, in the absence of new ways to perceive. Science has provided an overabundance of new ways of thinking. More than ever, we all need to learn new ways to see, feel, and find meaning.

—Howard Rheingold

Art & Physics

Leonard Shlain, 1991; 480 pp.

\$25 (\$26.50 postpaid) from William Morrow and Co./Wilmore Warehouse, 39 Plymouth Street, Fairfield, NJ 07004; 800/843-9389 (or Whole Earth Access)



In the latter half of the nineteenth century, while scientists fidgeted uneasily at their inability to explain puzzling features of space, time, and light, Impressionist and post-Impressionist artists alike incorporated into their art eccentric images that challenged long-held notions about these same three elements. The twentieth century opened with Einstein's brilliant 1905 solution to one of physics' unsolved problems and, simultaneously, introduced three artists who would thrust modern art through a transformative barrier.

Early in their respective careers, Henri Matisse, Pablo Picasso, and Marcel Duchamp assaulted the art world with works that both announced and represented three radical movements: Fauvism, Cubism, and Futurism. (Although Duchamp, a Frenchman, was not involved in the founding of Italian Futurism, his 1910 *Nude Descending a Staircase* is probably the most universally recognized image of this movement.) Fauvist painters were singing the praises of light in the form of color just as Einstein was enthroning light as the quintessence of the universe. Cubism presented a new way to visualize space, which was the first creative alternative to Euclid's views in more than twenty-two hundred years. Einstein also proposed an alternative concept of space. Futurism declared war on the traditional modes used to represent time. By dilating the present into the past and the future, Futurist painters captured an idea that paralleled Einstein's lightspeed. It was an extraordinary coincidence that these three different art movements, each focusing on a separate element of the special theory of relativity, erupted synchronistically with Einstein's radical publication. In a strange way, it is as if the art world with forethought decided to fracture the trinity of space, time, and light to better understand each element in isolation. Within a few years clustered around 1905, an explosion of the eye accompanied a hyperinflation of the mind.



FIGURE & GROUND

Information
Technology
and the
Economic
Marginalization
of Women

ALL TECHNOLOGIES HAVE HAD ILL EFFECTS. EVEN INFORMATION TECHNOLOGIES.

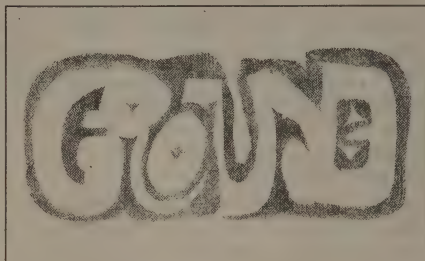
Take the Press, for example. Everyone likes the press. It spread learning, literacy, science, the birth of capitalism, wealth, the birth of learning, the Enlightenment, the Renaissance.

Women, however, have never recovered the equality lost in the Renaissance.

Male/female, mind/body, exterior/interior, public/private, left brain/right brain, mathematical/verbal, business/home, science/art — all comfortable cliches of necessary opposites. Opposites that are applied to gender as if they were biological, as if they were intrinsic.

But consider pre-press Europe.

Before the press and the spread of literacy, domestic and income-producing tasks were like figure and ground of an illustration, each depending on the other. The family was a productive, as well as a reproductive, unit. There was no business/home distinction.

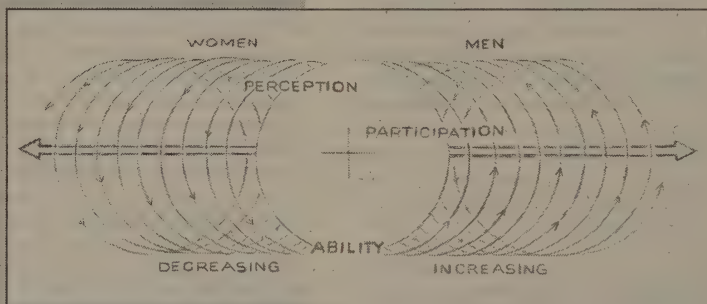


Among the lower classes, a craftsman's wife was the second in command, so that if he died the unit could continue. In the guilds, widows took over the voting rights of their husbands. The vote belonged to the unit; the husband was the agent for the whole. Women belonged to guilds, ran and worked at every kind of enterprise.

A journeyman became a master by marrying a woman from his guild without whom he could not run his business. Apprentices and journeymen did domestic tasks as well as producing goods for sale. Men and women participated in the care and training of children as a normal part of the supervision of the household. The household was the focus and the foundation of the economy. Master and mistress, journeymen, apprentices, serving wenches and children lived, worked, ate, and slept in common concern for the welfare of the whole. There was no public/private distinction. There was little adult/child distinction.

In an unstable world this made great sense. If times were hard they all ate more bread. If times were good they all ate more meat and drank better wine. And at all times they all worked.

Among the upper classes, women of the manor supervised the production of live-



As women do not participate they are perceived as not having ability, as they are perceived as not having ability they are kept from participation, as they are kept from participation they do not have experience of participation, as they do not have experience they become incapable, etc.

The reverse is true for men.

stock, dairy products, spinning, weaving, sewing, and the marketing and storage of all surplus goods. Enterprising women increased their income by expanding the workrooms under their supervision and selling the finished goods in town.

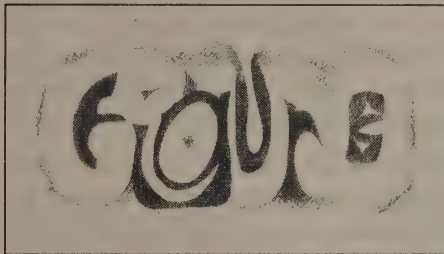
Among the elite, information and education were available to women whose families could pay for tutors. Spain and Italy continued the Muslim tradition of women mathematicians, astronomers, philosophers, doctors and poets in their universities. Germany had women professors and scholars. In France there was an entire class of Jewish women doctors, many trained at a large private medical school conducted by Sarah of St. Giles.

The press brought literacy and bookkeeping methods to the common people and changed the face of society. It emphasized some aspects of life at the expense of others, the way adding more ink to the word "figure" makes the word "ground" less visible.

Once people could keep track of the amount of material they needed and the amount of product they sold, it became apparent that some tasks were more lucrative than others. Maintaining a journeyman to swill the pigs or mind the baby didn't pay. Counting made it possible to plan and contracts made the future more secure. The flexibility of the common table and the common household became less necessary.

Tasks related to production of goods for sale emerged from the background of household activities. Domestic tasks became less visible as attention and resources went into production of goods for sale. The notion of labor became associated with tasks done for money. Business moved from the common room to a room of its own, to a floor of its own, to a separate building. With each move women became more and more identified with the background, the back quarters, the home—the beginning of distinctions such as business/home, public/private, exterior/interior.

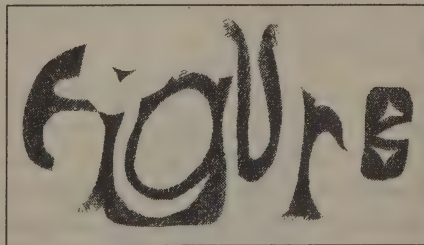
The social world was divided up in a new way. Before the press, it was divided horizontally, by class. Information and education belonged to the elite. After the press, the world was divided vertically, by gender. More men of all classes had access to information. If they could use it to their advantage they could be socially and economically mobile. Women had little access to information and education, and their economic and social mobility depended on marriage.



The press emphasized and enlarged the slight differences that had existed, so both men and women were caught in deviation-amplifying (positive) feedback loops; over time their life experiences spiraled away in opposite directions.

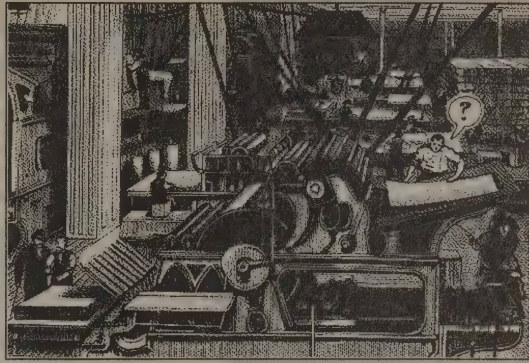
Children and childhood emerged as different and separate from adults as adulthood became associated with literacy. The definition of what it meant to be a man or woman changed. Men were literate. They were perceived as adult and became identified with an individualistic mental realm of business, publicness, exteriority and intellect. Few women were literate. They became equated with children and identified with a communal physical realm of home, privacy, interiority, emotion and biologicalness.

The economic world took on a dynamic of its own: a positive-feedback loop that created wealth out of manufacturing based on standardization, simplification and replication — ideas that emerged with the press, whose standard movable type turned out exact duplicates time after time.



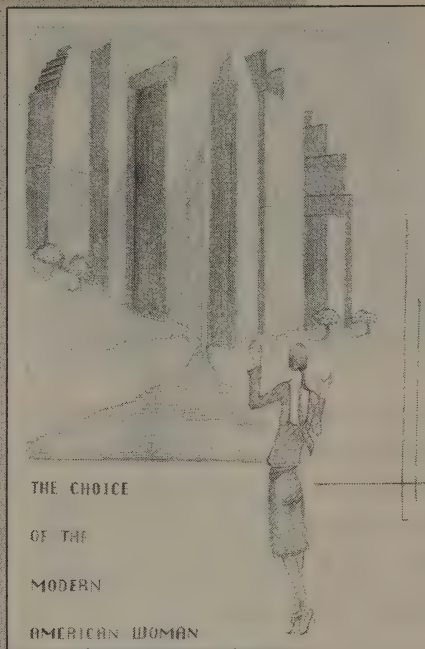
Over time, more goods were manufactured and more people had disposable income. This income became the source of more wealth. Markets expanded and so did the size and diversity of the economic sector, the sector associated with and run by men. Women and children participated as underlings. They worked in the sweatshops and mills, as more and more of what a family wanted was to be had for cash rather than made at home.

Still, until the middle of the last century, most women had important economic roles and many had independent sources of income. Most people lived on farms. Farm women had their egg- and butter-money or money from selling garden produce and handicrafts. All



Eli Whitney (the inventor of interchangeable parts) wrote to the Secretary of War: "One of my primary objects is to form the tools so that the tools themselves shall fashion the work and give to every part its just proportion — which when once accomplished will give expedition, uniformity, and exactness to the whole. . . . In short, the tools which I contemplate are similar to an engraving on copper plate from which may be taken a great number of impressions perceptibly alike."

BY
ELIN
WHITNEY-SMITH



The woman is shown on the way to the modern city. Physically she is shown as impossibly tall and thin, yet she is held up as an ideal. She is standing lower than, and therefore subject to, the city. Advertisements of the era show men standing above the city in a position of dominance. The window symbolizes light, and the road freedom. Pictures of the bad woman or bad man are shown in rooms without windows.

Elin Whitney-Smith's last contribution to WER was "Information Doesn't Want" (#72, p. 38). Her email address is elin@well.sf.ca.us from any Internet site.
—Howard Rheingold

women made important economic contributions to the welfare of the family. They made and maintained the family's clothes and prepared, preserved and stored food. Most business was still family business — small, local manufacturing or craft shops in small towns. The dream of social mobility was the dream of a family business.

The railroad, the telegraph, then the telephone freed business from geographic constraints and revolutionized how business was done. These technologies completed the economic marginalization of women started by the press.

The press had helped the tasks related to production to emerge from the background of other household activities, like figure from ground. Use of electronic communications technology helped tasks related to command and control to emerge from the background of business ownership. Before electronic communications, the business hierarchy, like the military hierarchy, was based on class: all noncommissioned personnel take orders from all officers, and an officer is still an officer and a gentleman.

Starting in the communication industry, then spreading throughout the economy, people realized communication was more effective if the channel was dedicated and specialized. They applied the engineering notion as a general principle to business management. The new managerial hierarchy was a communications structure. Workers only had to take orders from *their* managers. Because it was suddenly not a social hierarchy, managers did not have to be members of the family that owned the business. This changed the definition of social mobility, and a new class of salaried, professional managers emerged.

These career managers had an interest in the growth and stability of business as an entity instead of business solely as a source of income for the owners. Some realized that management itself could be standardized and the techniques could be applied in many settings. Eventually this led to the corporate structure we know today. To keep the business sector expanding, it was important that as many things as possible be manufactured. This was another positive feedback loop which emphasized man as breadwinner and deemphasized woman as breadmaker.

The pump that kept this feedback loop moving was advertising. Advertising may not always have sold individual products well, but it did a great job of selling the American Dream. The woman in the illustration is looking up the road to a modern, technologically produced, urban paradise. It gave people a criterion for happiness and told them it could be achieved with money.

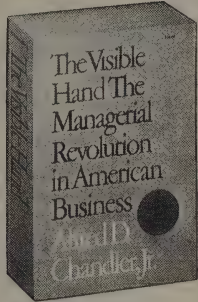
The economic marginalization of women was complete, finishing the process that had started with the printing press, and the real world had become the economic world. The definition of the family has changed. Women who used to produce everything from thatched roofs to beer now only produce sex and children. The entire definition of gender has changed. The dualities are real and oppressive and much of it is due to information technology.

Yet we can't blame the technology as an evil monster, nor can we blame men as oppressors, or women as participants in victimization. We can't even blame the existing social context. There are no villains and there are no easy answers in this story. The best we can do as we question technology is to realize how the figure/ground dynamics emphasize some relationships at the expense of others, in a way that amplifies small differences in starting conditions quickly, by the gears and ratchets of technological power. ☞

The Visible Hand

Between 1840 and 1920 the organization of organizations changed from medieval partnerships to modern hierarchical corporations. Alfred D. Chandler's clear, fast-paced history attributes the revolution to the ability of professional managers to monitor and allocate resources amongst a number of units more effectively than market mechanisms. When and where this happened, the business was more competitive, so it prospered while others went extinct. To think about business structure, we must know its strengths and history. This book helps.

—Elin Whitney-Smith



The Visible Hand

Alfred D. Chandler, Jr., 1977; 608 pp.

\$14.95 (\$16.95 postpaid) from Harvard University Press/Customer Service, 79 Garden Street, Cambridge, MA 02138; 617/495-2600 (or Whole Earth Access)

The experience of the American Tobacco Company provides several important lessons for understanding the rise and function of the large entrepreneurial enterprise. First, the massive output made possible by application of continuous-process machinery to manufacturing caused and indeed almost forced the creation of a worldwide, integrated organization. The resulting managerial hierarchy permitted its creator to dominate first the cigarette and then the rest of the tobacco industry, except for cigars. The founder fully realized the importance of his organization. According to his biographer, he always considered that his major task was to find and bring forward competent managers.

In mass marketing and distribution, retailers continued to expand at the expense of wholesalers. Retail enterprises grew by adding new lines and, even more, by adding new outlets or stores. The chain store became the fastest growing channel of distribution. The existing chain stores expanded more rapidly than other types of retailers. And new chains appeared more often than did new department stores or mail-order houses. Chains moved into the drug, grocery, and other trades that had hitherto been the domain of the wholesaler and the small retailer. Department stores began, albeit most hesitantly, to enlarge their business by building branches in the suburbs.

Advertising the American Dream

Advertising has not sold individual products as well as it has sold the criteria for happiness.

Roland Marchand analyses advertising from its art, clichés and ethics to its parables, history and people in a witty style, liberally illustrated with advertisements from the teens, twenties, and thirties. He shows how the selling of modernity has done much to redefine the American way of life. —Elin Whitney-Smith

Could logically minded, educated, adult men spend most of their time talking down to an audience of fickle, irrational, child-like women without losing their self-respect? Many adherents of the "irresponsible public" school feared they could not. The most effective ideas in reaching that audience, Frank Fletcher confessed, "are those that fill an intelligent man with secret embarrassment and shame."

This "window-on-the-future" tableau fused business executive (with telephone at the ready) with company scientist. No window panes blurred his communion with the modernity of the airplane and the cubistic city.



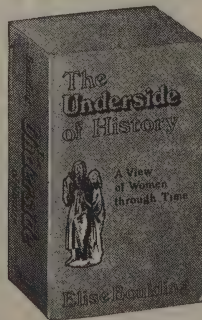
Men who live for tomorrow

Frank Fletcher's advertisement for the Quaker Oats Company, circa 1910. The man in the foreground is looking out over a futuristic cityscape. The airplane in the sky is a biplane. The buildings are tall and cubistic. The scene is a vision of the future.

The Underside of History

This book, more than most, cannot be separated from the person of its author. Boulding has written as a scholar, Quaker, mother, grandmother and activist in an

attempt to answer why women have had to work for public good from privatized spaces. The attempt is, as she states, a failure. Yet it brings together a picture of women's lives through the millennia so that the reader can begin to see how "real" history could not and would not have occurred without support, adjustment, work, thought, and flexibility from the underside. —Elin Whitney-Smith



The Underside of History

(A View of Women Through Time)
Elise Boulding, 1976; 829 pp.

OUT OF PRINT. Westview Press, Boulder, CO

Urban working women bore the brunt of an industrialization that outpaced every kind of facility for human welfare, and it is among the urban proletarian women that we find the revolutionaries of the nineteenth century. In France, these women revolutionaries were the grandchildren and great-grandchildren of the bread rioters of the eighteenth century. When Louise Michel broke into the bakeries of Lyons in 1882 to distribute bread to the unemployed, she was following an old tradition.

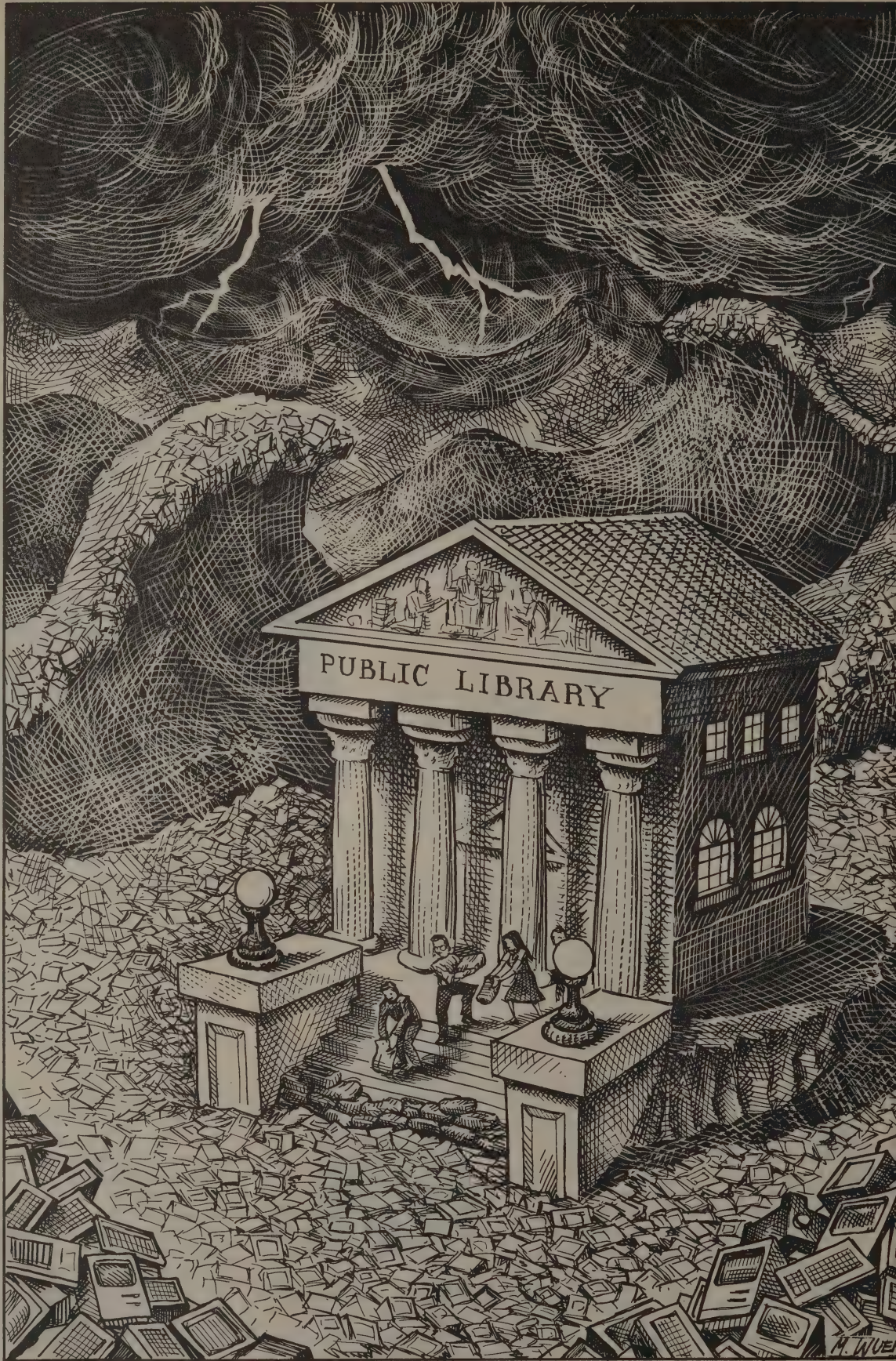


ILLUSTRATION BY MATT WUERKER

Reclaiming Our Technological Future



IT IS EASY TO GET THE IMPRESSION that the future of libraries and librarians depends on new technology. We read the predictions in the literature. We hear them at conferences. We budget more and more money. We plan our services based on them.

Predicting the future is tempting. The future is, after all, where we are all going to live — soon. Predictions seem to abound at the end of every decade as we look ahead to the next. Why? As Ambrose Bierce once said: "The future is that period of time in which our affairs prosper, our friends are true, and happiness is assured."

Predictions, particularly predictions about electronic technology, too often cause us to assume that the future will just happen, not that we can play a key role in inventing it. These predictions, combined with very real social and technological trends, can both comfort and frighten. We often cope with trends and the predictions based on them by envisioning a future that connects events and developments that might otherwise seem random.

PREDICTION AND FANTASY

This vision comprises a series of collective — almost unconscious — fantasies. These fantasies influence our interpretation of reality. The power of fantasy lies both in its simplicity and its broad scope. Fantasy evokes both fear and hope. It shapes our collective judgment, and it often drives our philosophy.

Librarians' collective fantasies go something like this:

- We are in the midst of an information explosion. Our only hope for controlling this explosion is through the use of technology.

- New technology will provide users with greater access than ever before. Individuals will easily and directly access information to fill their needs from their homes and offices.

- Librarians could be key players in the information marketplace — or they could become obsolete. Our challenge is to figure out what business libraries are in: the book business, or the information business?

Two major assumptions are at work here. The first is that we are moving toward a paperless society. Books will soon be historic artifacts, and full-text electronic publishing will hold sway. The second assumption is that hardware and software will be readily available, usable, affordable, desirable, and satisfying to everyone.

Librarians envision a world of accessible electronic information and an ever-increasing number of workstations, complete with artificial-intelligence systems. Well-trained

BY PATRICIA GLASS
SCHUMAN

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—Howard Rheingold

end users with well-defined information needs will access the world's information store with little more than a keystroke.

These fantasies are as seductive as a love affair. There is the hope of enchantment, the possibility of dependence, and the fear of betrayal. Fantasies often contain truths; they strike some note of recognition. But they are oversimplifications of reality. Nevertheless, fantasies often influence both our public philosophy and our decisions about programs and services.

DATA provide neither enlightenment nor knowledge. Words and phrases like "misinformation," "disinformation," "meaning glut," and "info lag" are entering our vocabulary. What we are really experiencing may be access to excess. The mere fact that there is more data available does not mean that people either want it or can use it meaningfully.

research libraries have doubled in the past 14 years.

We may readily throw out with our nightly garbage more print than past generations dreamed it was possible to own. But what are these statistics really dramatizing? They tell us that there is more data than ever before — not that there is better data, more relevant information, or even a more knowledgeable society.

More than 60 percent of a typical newspaper's content is advertising. A typical American reads three books a year. What we are actually experiencing is not an information explosion. It is an explosion of data. Some scientists now claim that it takes less time to do an experiment than to do the research to find out whether or not it has been done before.

Richard Saul Wurman, author of *Information Anxiety*, calls what is happening the "non-information explosion." Data provide neither enlightenment nor knowledge. Words and phrases like "misinformation," "disinformation," "meaning glut," and "info lag" are entering our vocabulary. What we are really experiencing may be access to excess. The mere fact that there is more data available does not mean that people either want it or can use it meaningfully.

ACCESS TO EXCESS

Take the information-explosion fantasy. The statistics are dramatic:

- Americans bought 13.2 million tons of newspapers in 1988.
- Over one million books are published annually — over one thousand per day worldwide.
- A weekly edition of *The New York Times* contains more information than the average person was likely to come across in a lifetime in seventeenth-century England.
- The English language now contains 500,000 words, five times more than in Shakespeare's time.
- The collections of large

An individual must be literate in order to negotiate our complex social, political, economic, and work environments. But print illiteracy is almost a national disaster. Twenty-three million adult Americans cannot read above a fifth-grade level; 20 percent are unable to write a check that a bank can process. An individual must not only be print-literate. He or she must be culturally literate, visually literate, and computer-literate. With all these skills, the individual might then have a chance at being "information-literate."

An educated user also needs an awareness of the value of information and the financial wherewithal to use it. What does our fantasy about direct home delivery of information services really mean in a society where 25 percent of households below the poverty line have no telephone? Only 13 percent of US households own a personal computer. Only 10 percent of these have modems. Seventeen percent of all white children use a computer at home, while only 6 percent of black and Hispanic children do.

Rather than providing universal delivery, there is a very real possibility that technology could widen the gap between the information-rich and the information-poor. We may fantasize about universal access, but the threat of narrow control in an information society is all too real.

THE INFORMATION OLIGOPOLY

While the computer can conceivably sort through and select information in a matter of minutes, some human being somewhere has to feed the databank. The question is not just access. What will we have access to? Do we know who is feeding the databanks that have multiplied like rabbits in the last decade? Not exactly. What we do know is that the number of companies that control information is shrinking.

Eighty-five percent of existing databases are in the Northern hemisphere; 70 percent are in the United States. One company, IBM, is responsible for manufacturing two-thirds of the world's computers. Eighty percent of the market for workstations is controlled by four companies. Five commercial database vendors account for over 90 percent of the sales and uses of database services.

Once an industry made up of independent, family-run companies, trade-book publishing is now dominated by a handful of corporations. Hachette, Inc., a French company, is the world's largest producer of magazines and reference books. Rupert Murdoch is the largest newspaper publisher in the world. He also has extensive holdings in Fox Broadcasting and 20th Century Fox—not to mention Harper & Row, *TV Guide*, and other magazines. Murdoch is the largest publisher of evangelical Christian books in the United States.

Journalist Ben Bagdikian's June 12, 1989 *Nation* article, "The Lords of the Global Village," documents a global media oligopoly that is largely invisible to the consumer. It controls newspaper, magazine, and book publishing, as well as broadcast stations, film studios, and software and hardware companies.

Bookstores and libraries still offer miles of shelves stocked with individual volumes . . . but if this bright kaleidoscope suddenly disappeared and was replaced by the corporate colophon of the few who own this output, the collage would go gray with the few media multinationals that now command the field.

Bagdikian warns:

Neither Caesar, nor Hitler, Franklin

Roosevelt, nor any Pope, has commanded as much power to shape the information on which so many people depend to make decisions about everything from whom to vote for to what to eat.

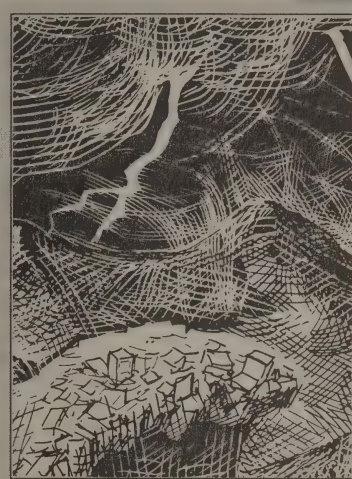
Ian Reinecke, author of *Electronic Illusions* and an admitted "techno-skeptic," concurs:

The evidence is that the unholy alliance of the technocrat and the accountant that rules over major publishing groups will not be the best guardian of editorial quality. . . . Although computer databanks may amass information at an astonishing rate, and the information industries may churn out vastly greater quantities of it, ordinary citizens may grasp little of it. . . . There is no evidence that the growing conglomeratization and privatization of information will be either efficient or equitable.

Our fantasy tells us that new electronic technologies will help to widen access. In reality the potential control of information access is in the hands of media conglomerates and technology producers.

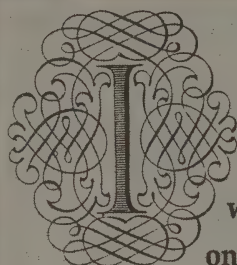
THE FULL-TEXT FALLACY

What about the paperless-society fantasy F. W. Lancaster and others propound? This fantasy is based on the notion that books will become obsolete. Full-text electronic materials will easily be accessible via workstations, and no one will really need to visit a library at all.



RATHER than providing universal delivery, there is a very real possibility that technology could widen the gap between the information-rich and the information-poor.

I disagree. To paraphrase Mark Twain: Rumors of our death are greatly exaggerated. If you think we are on the fast track toward a paperless society, just take a look at your desk. Several fallacies underlie the fantasy of the quick demise of books and libraries.



If you think we are on the fast

track toward a paperless society, just take a look at your desk. Several fallacies underlie the fantasy of the quick demise of books and libraries. This fantasy is dependent on the notion that all information will be produced, stored, organized, and manipulated electronically. The reality is that the quantity of printed information is doubling every five years.

This fantasy is dependent on the notion that all information will be produced, stored, organized, and manipulated electronically. The reality is that the quantity of printed information is doubling every five years. While most publishers now use electronic means to typeset books, journals, and newspapers, very few of these will ever be offered for electronic distribution.

Print publishers are using technology because it's cheaper. For many, it's cheaper only because they can use computer disks that authors supply to them. Any publisher will tell you that while technological costs are dropping, the costs of intellectual labor are rising.

Electronic publication requires a different intellectual design than a book. Books and journals are specific intellectual containers. Like databases, they too have access points: tables of contents, chapter headings, running heads, indexes, etc.

Each of these is a conceptual package that is not necessarily enhanced by — or transferable to — electronic media. Do we really need to read *Real Men Don't Eat Quiche* at a workstation?

For most publishers, electronic publishing is conceptually uncertain at best and economically risky at worst. Newspapers and many magazines depend on advertising for a substantial portion of their revenues. The

price of a page of advertising is usually based on the number of people who buy or subscribe. Can electronic publishing — which is geared for individual, on-demand use — guarantee circulation numbers for advertisers?

Book and journal publishers receive payment up front upon purchase by the consumer. With technological dissemination, the publisher is paid only upon use. How can a publisher predict the demand for a specific article or chapter? There is also a morass of other complications like the questions of copyright, ownership, and textual integrity.

Full-text availability online as a replacement for paper may be somewhere off in the distant future. But, although all Neal-Schuman books and journals are now typeset electronically, as a publisher and librarian I have little faith in an electronic distribution system that pays a royalty per use for a publication. That is not to say we might not publish software — or a large database — along with our books and journals. But I have no idea how a user might access a single part of a 300-page book — or how often. I have no idea how to find out. And I am not alone.

As a publisher I attempt to publish not just data, but information and knowledge within a conceptual framework: a book or journal. The organization, design, and content are of a piece that I, for one, do not wish to see either fragmented or condemned to total oblivion. Our books and journals are designed not just for data retrieval, but for browsing, thinking, reading, and connections between people and ideas.

Remember the prediction that film would replace books? That television would replace radio and film? Instead, what generally has happened during each new stage of communications technology is that the possibilities have expanded, not contracted.

Part of the fantasy is that technology is always successful and generally accepted. That's just not true. Remember the Betamax video format? Or eight-track tapes?

Remember automats — those self-service restaurants that were considered great examples of labor-saving technology in their time? You looked through small windows; behind each was a dish of food. You made your choice and put your coins in a slot,

the window opened, and out came your selection.

Restaurateurs who thought they were in the food-delivery business fantasized that these self-service restaurants would eliminate a whole class of workers: waiters and waitresses. They could cut down their personnel costs and deliver more food to more people more quickly and cheaply.

How many automats are around today? The proponents of automats forgot one thing — the importance of human contact. Diners want to be able to ask someone: "How's the fish?" "What's the special today?" "What wine do you recommend?"

There will, no doubt, be new information products produced that you and I have never even imagined. But that is not a corollary to the fantasy that print will die.

Without the reality of the paperless society, there is little chance that libraries will shed what some call their "edifice complex" very soon. We know that the rate of obsolescence of equipment and software is about three to five years. And we think we have a problem with brittle books?

Even if the amount of electronic information expands dramatically and becomes crucial to the average individual, many people will choose to access databases from the library. They will choose to use libraries because they do not own a computer or because they want librarians, who are expert at searching, to act as intermediaries between them and the electronically packaged data.

THE BUSINESS FANTASY

Which brings us to the next, and perhaps the most dangerous, of our fantasies. This is the fantasy that says: libraries must decide whether they are in the book-delivery business or the information-delivery business.

The business proposition is often urged upon librarians. The most frequent metaphor used to illustrate the argument is that of the railroad companies that failed to realize that their business was not trains but transportation.

The metaphor is a glib one. But libraries are not in either the book or the information business. Nor should they be *in* business. They cannot hope to compete with the Max-

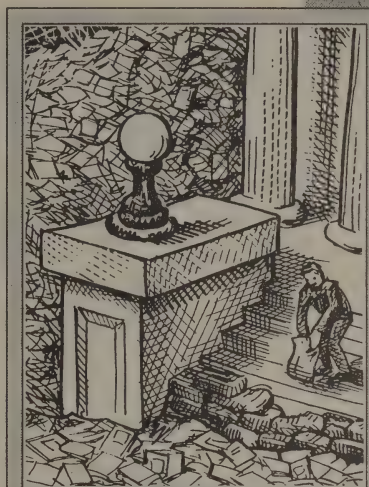
wells and the Murdochs, nor with AT&T nor IBM, all of whom claim that *they* are in the information business.

Adopting the vocabulary and methodology of business can be a dangerous game for the library profession. This fantasy can lead us to follow the agenda of the marketplace rather than to forge our own. The production, management, and sale of information is something quite different from the provision of access. It implies efficiency, not equity. Just look at what the concept of managing information has done to public access to government information: cutbacks, privatization, increased user fees, and, generally, less access to less information.

Conversely, private-sector, profit-oriented companies that are in the so-called information business do not — and cannot — compete with libraries: not with library services, not with library programs, not with library collections, not with the expertise of librarians.

Their computers can certainly collect data. They can store it. They can manipulate, organize, and transmit it. But knowledge is a human achievement. It is not always immediately profitable in the marketplace.

Workstations — or any technology, for that matter — are a means for extending the capacity of the human brain. They do not replace it. "User-friendly" is not synonymous with responsiveness. Those ubiquitous bank teller machines, for example, provide simple, preprogrammed answers to a limited number of questions. Most individual information problems are not so



OUR books and journals are designed not just for data retrieval, but for browsing, thinking, reading, and connections between people and ideas.

well defined either by subject or scope. The user often does not articulate a specific need that can be filled by a single source. Solving simple problems is not adequate reference service. Personal communication with computers is not individual conversation. It is, in fact, programmed response.

What about the promise of expert systems and artificial intelligence? Thomas Anantharaman, co-inventor of Deep Thought, a computer that can play chess at about the level of a Grand Master, is quoted in a recent issue of *Discover*. He says:

Few problems are as well defined as they are in chess. Computer chess will give you an idea of how to approach a problem . . . but it won't solve the problem completely. I can't think of a single real-world problem that has been solved by artificial intelligence.

So much for the artificial-intelligence fantasy. Systems are programmed. They can't take initiative. Libraries can. And they must.

We know libraries are not self-sufficient or self-sustaining. How can we expect a user with a workstation to be? We have never even been terribly successful teaching

people to use reference books. Our most successful technique is the in-depth reference interview.

People only use technology on a regular basis if it is simple, unobtrusive, and satisfying. I haven't got a clue about how my television works. I merely pick up a receiver to dial my telephone. I put a videotape into my VCR and push "play." Computers are not yet that simple. The promise is that they

may be. In the meantime, there are bugs in my software. My manual is unintelligible. I don't understand the DOS commands.

Some members of my profession may fantasize that technological devices and business methods will change the image of libraries and improve our status as librarians; that the management and merchandising of information should be our new role. Some also fantasize that charging fees will increase the user's recognition of the value of library services. The underlying logic is faulty. I know the value of a Mercedes-Benz. So what? I can't afford one. This is like saying that if we charge people for borrowing books, more people will read.

We in the library profession will make a grave mistake if we persist in the marketplace fantasy. Certainly, we must understand that libraries are a market — a large consumer of information services and products. But libraries have no business *in* business.

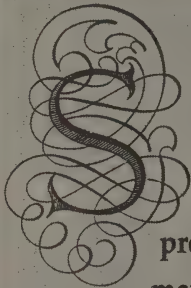
UNDERSTANDING THROUGH KNOWLEDGE

Libraries are service organizations. Librarians are service-oriented professionals. Our business is not information. Our mission is to facilitate understanding through knowledge.

A telephone operator fills an information need; and telephone operators are gradually being replaced by computers. Postal workers deliver documents; computers and fax machines often do so more efficiently. Both provide information delivery — even access of a sort — to very limited kinds of data and documents. The mission of librarians is not just to simply fill specific information needs. Our mission is to solve information problems.

The business fantasy suggests that instead we must transfer the cost — and possibly even the necessity for information skills — back to the user. A dentist does not expect a client to fill his or her own teeth; the medical profession does not advocate self-diagnosis and treatment.

Rather than attempting to be entrepreneurs who believe, as the former head of the British Lending Library Maurice Line does, that "We can have our cake — and eat it, too — if



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that technological devices and business methods will change the image of libraries and improve our status as librarians; that the management and merchandising of information should be our new role. Some also fantasize that charging fees will increase the user's recognition of the value of library services.

we sell it," librarians should stop trying to compete in what we fantasize as the great information technorace. Instead, we must move beyond fantasy and deal with reality.

The reality is that there is a discrepancy between what is technically feasible, what is practical, and what is actually happening. Computers don't think. Neither does a library. Creation of services is a human function. The future direction of library services is largely up to librarians. No technology can beat the highly developed skill of a librarian who can analyze an information problem, figure out the real underlying questions, and match those questions with answers.

No machine can compete with a creative, knowledgeable, flexible professional librarian, one who provides interpersonal interaction, information evaluation, communication, synthesis, and judgment. No software is better than a librarian who demands a say in future technological developments that affect library services, and who is not a passive recipient of vendor-driven technology and services. What actually happens will depend not just on technological innovations, but on our human creativity and ingenuity.

"Libraries provide not only — but also," says Lester Asheim:

Society, certainly a democratic one, needs some communication agency which judges the importance of an idea on the basis of the individual who might be touched by it and not by the particular mechanism on which it happens to be carried, or by the size of the audience that is willing (or able) to pay for it.

Far from wiping out the need for librarians, technological tools can be a means to help us develop whole new levels of service. Business equates information with profit. Librarians must equate information with understanding.

The role of the librarian is to distinguish between data and information, between facts and knowledge. Librarians must be concerned not only with the what and the how but with the why. Access means more than mere physical location. It means the connection of ideas to people.

Our challenge is not just to provide more information, or even just the right answers. Our challenge is to help people formulate the right questions. When Albert Einstein was asked what single event was most helpful in developing the theory of relativity, he is said to have answered, "Figuring out how to think about the problem."

Helping others to do the same is the challenge before us if we truly have a commitment to excellence.

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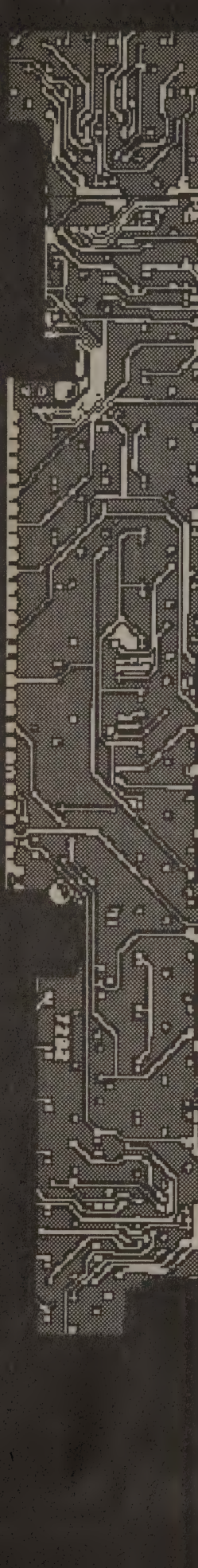
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WHY MULTIMEDIA PUBLISHING IS A CROCK

ANY

For several years, computer enthusiasts have been predicting the next computer revolution, in which text, sounds, and images could be combined in a CD-ROM format that people could use with their personal computers: multimedia.

In 1988, Whole Earth (with Broderbund Software and Apple Computer) created the Whole Earth CD-ROM, an experimental foray into this new medium. It was a nifty product, and it answered a lot of questions about how computer people and magazine people could collaborate effectively. But three years have passed, and CD-ROM players are still not common household appliances. Tim Oren, Apple's project manager on the Whole Earth CD-ROM project, believes it is time to rethink the whole idea from the point of view of the people who might want to use such a medium.
—Howard Rheingold

HARDWARE AND SOFTWARE COMPANIES are attempting to develop a new, computer-based medium, which has been tagged "multimedia." Most of these systems use mass-produced optical discs to store information, which you might someday buy at the corner audio or video store like tapes or audio CDs. This scenario is called multimedia publishing.

The purpose of any medium is to send messages. Since today's consumers already live in an information-saturated world, these new messages compete for a scarce resource: time. Messages compete for time in two ways: salience and production value. Salience is the relevance of the message to the consumer's personal interests. Production value is the amount of attention-getting media "heat" embodied in a message.

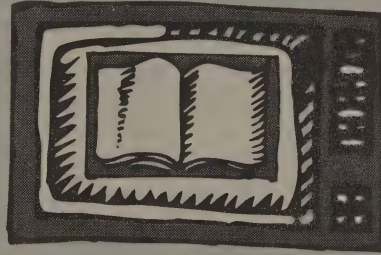
To give two examples: A car commercial on network television is likely to have extremely high production value — fast cuts, lots of action, and fancy graphics — but its salience to most consumers at the point of viewing is low. The production value of a three-line newspaper classified ad for a used motorboat is very low, but its salience to those who purposely turn to that column in the newspaper is high.

While both factors might be maximized, economic constraints usually encourage a trade-off between salience and production value. Targeted direct mail is a way in which advertisers pay to optimize salience. Very few direct marketers go the next step and also increase production value by, for example, mailing videotapes instead of print.

The fixed nature of current media emphasizes the trade-off of salience and production value. For instance, network television has been inherently broadcast. With no means to optimize salience, the uniform trend in television is toward attention-getting high production value. This is seen even in news programs, which, though timely, are limited in their salience to any particular viewer.

Re-examining New Media

BY TIM OREN



READER RELEVANCE

INFORMATION which is optically published — compiled, edited and then pressed onto a compact disc — has limited currency and novelty due to the time taken to prepare and ship the material.

Also, while the presentation order may be varied (by hypertext, search, guides and so forth), the underlying content always remains the same, and the portion relevant to a particular consumer will be exhausted at some point. These are two ways of saying that in spite of claims of "interactivity," a medium based on optical publishing is inherently limited in salience.

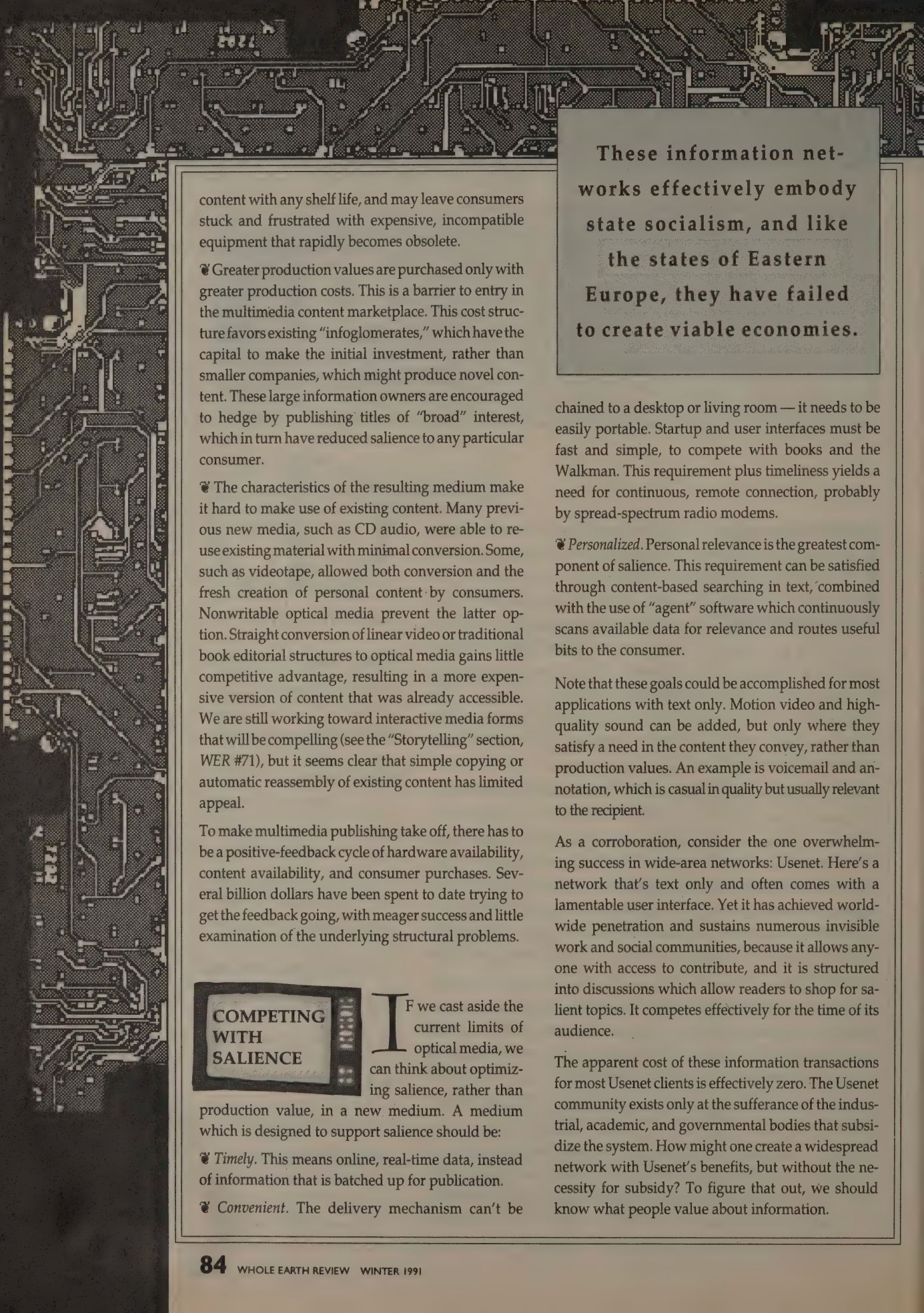
Books, magazines, and newspapers have had similar limitations for 500 years and have done quite well. But multimedia has some further obstacles to overcome: the lack of portability of most players and the time required to swap discs limit the "ready-to-handness" of the medium in comparison to books. A multimedia "reader" device must be purchased before any discs can be used. Since a new medium must be better than existing media in some respect to justify the initial purchase, multimedia systems have to find a way to compete in spite of these limits.

But optical publishing is locked into the wrong basis for competition. Since it cannot further improve salience to the end user, it must hike production values to compete. The medium must become capable of accepting these higher values and rendering them for the consumer, hence the push for full-screen motion video, rich stereo sounds, faster animation rates. But this leads to a series of problems:

☛ Today's consumer-priced hardware is stretched to its limits to deliver acceptable video, graphics, and sound. This keeps system costs high, and will lead to frequent model changes as manufacturers try to push performance. This makes it harder to create multimedia

✧

To make multimedia publishing take off, there has to be a positive-feedback cycle of hardware availability, content availability, and consumer purchases. Several billion dollars have been spent to date trying to get the feedback going, with meager success and little examination of the underlying structural problems.



These information networks effectively embody state socialism, and like the states of Eastern Europe, they have failed to create viable economies.

content with any shelf life, and may leave consumers stuck and frustrated with expensive, incompatible equipment that rapidly becomes obsolete.

☛ Greater production values are purchased only with greater production costs. This is a barrier to entry in the multimedia content marketplace. This cost structure favors existing “infoglomerates,” which have the capital to make the initial investment, rather than smaller companies, which might produce novel content. These large information owners are encouraged to hedge by publishing titles of “broad” interest, which in turn have reduced salience to any particular consumer.

☛ The characteristics of the resulting medium make it hard to make use of existing content. Many previous new media, such as CD audio, were able to re-use existing material with minimal conversion. Some, such as videotape, allowed both conversion and the fresh creation of personal content by consumers. Nonwritable optical media prevent the latter option. Straight conversion of linear video or traditional book editorial structures to optical media gains little competitive advantage, resulting in a more expensive version of content that was already accessible. We are still working toward interactive media forms that will be compelling (see the “Storytelling” section, WER #71), but it seems clear that simple copying or automatic reassembly of existing content has limited appeal.

To make multimedia publishing take off, there has to be a positive-feedback cycle of hardware availability, content availability, and consumer purchases. Several billion dollars have been spent to date trying to get the feedback going, with meager success and little examination of the underlying structural problems.



IF we cast aside the current limits of optical media, we can think about optimizing salience, rather than production value, in a new medium. A medium which is designed to support salience should be:

☛ *Timely.* This means online, real-time data, instead of information that is batched up for publication.

☛ *Convenient.* The delivery mechanism can't be

chained to a desktop or living room — it needs to be easily portable. Startup and user interfaces must be fast and simple, to compete with books and the Walkman. This requirement plus timeliness yields a need for continuous, remote connection, probably by spread-spectrum radio modems.

☛ *Personalized.* Personal relevance is the greatest component of salience. This requirement can be satisfied through content-based searching in text, combined with the use of “agent” software which continuously scans available data for relevance and routes useful bits to the consumer.

Note that these goals could be accomplished for most applications with text only. Motion video and high-quality sound can be added, but only where they satisfy a need in the content they convey, rather than production values. An example is voicemail and annotation, which is casual in quality but usually relevant to the recipient.

As a corroboration, consider the one overwhelming success in wide-area networks: Usenet. Here's a network that's text only and often comes with a lamentable user interface. Yet it has achieved worldwide penetration and sustains numerous invisible work and social communities, because it allows anyone with access to contribute, and it is structured into discussions which allow readers to shop for salient topics. It competes effectively for the time of its audience.

The apparent cost of these information transactions for most Usenet clients is effectively zero. The Usenet community exists only at the sufferance of the industrial, academic, and governmental bodies that subsidize the system. How might one create a widespread network with Usenet's benefits, but without the necessity for subsidy? To figure that out, we should know what people value about information.



VALUE IN INFORMATION TRANSACTIONS

PEOPLE are willing to pay for two aspects of information transactions, which

I'll call "push" and "pull," borrowing from marketing jargon. The most obvious form of a push transaction is broadcast network advertising. The advertiser pays to push out his information at the audience, whose viewing is totally subsidized by this activity. Trade publications and free "advertiser" newspapers are similar examples.

In a pull transaction, the consumer pays to acquire information of perceived value. Book-buying is the oldest example, but purchases of video- and audio-tapes fit the same pattern.

Mixed systems are common. For instance, consumer magazine revenues commonly consist of two parts advertising to one part subscription. The readers pay a third of the freight for getting a perceived useful slice of information; the advertisers pick up the rest in consideration of the audience delivered by the publisher. Newspapers' revenues are likewise split between advertisers and subscribers.

The characteristics of existing media make it difficult to change a given system's position in this value spectrum. It would be impossible for a magazine to be trade-subsidized one month, fully subscriber-paid the next, and mixed the third. A television channel might be advertiser-subsidized, "public," premium cable, or pay-per-view, but it won't change overnight. There is even less possibility of a consumer altering the nature of his or her relationship with the system on an individual basis.

NETWORKS AS A MEDIUM

TODAY'S commercial computer networks can also be positioned on this spec-

trum. Dialog is a pure pull network — it delivers very salient information at a high cost. CompuServe is a pull model at the consumer level. Prodigy is the first mixed-model network — the users' access is partially subsidized by the push value of the advertising scrolling across a portion of the screen.

In consumer systems such as CompuServe and

Prodigy, the network owner is the only authorized vendor of information. That is, users may post messages, often through a moderator, but they do not receive value when others read them. All revenue goes to the system owner. In some cases, technical experts may receive subsidies or even royalties for their participation, but these arrangements must be especially negotiated with the system owner. Messages which might be construed as advertising are forbidden on most systems.

These practices add up to centralized control of the means of information production, and a complete lack of market interaction among the users. These information networks effectively embody state socialism, and like the states of Eastern Europe, they have failed to create viable economies.

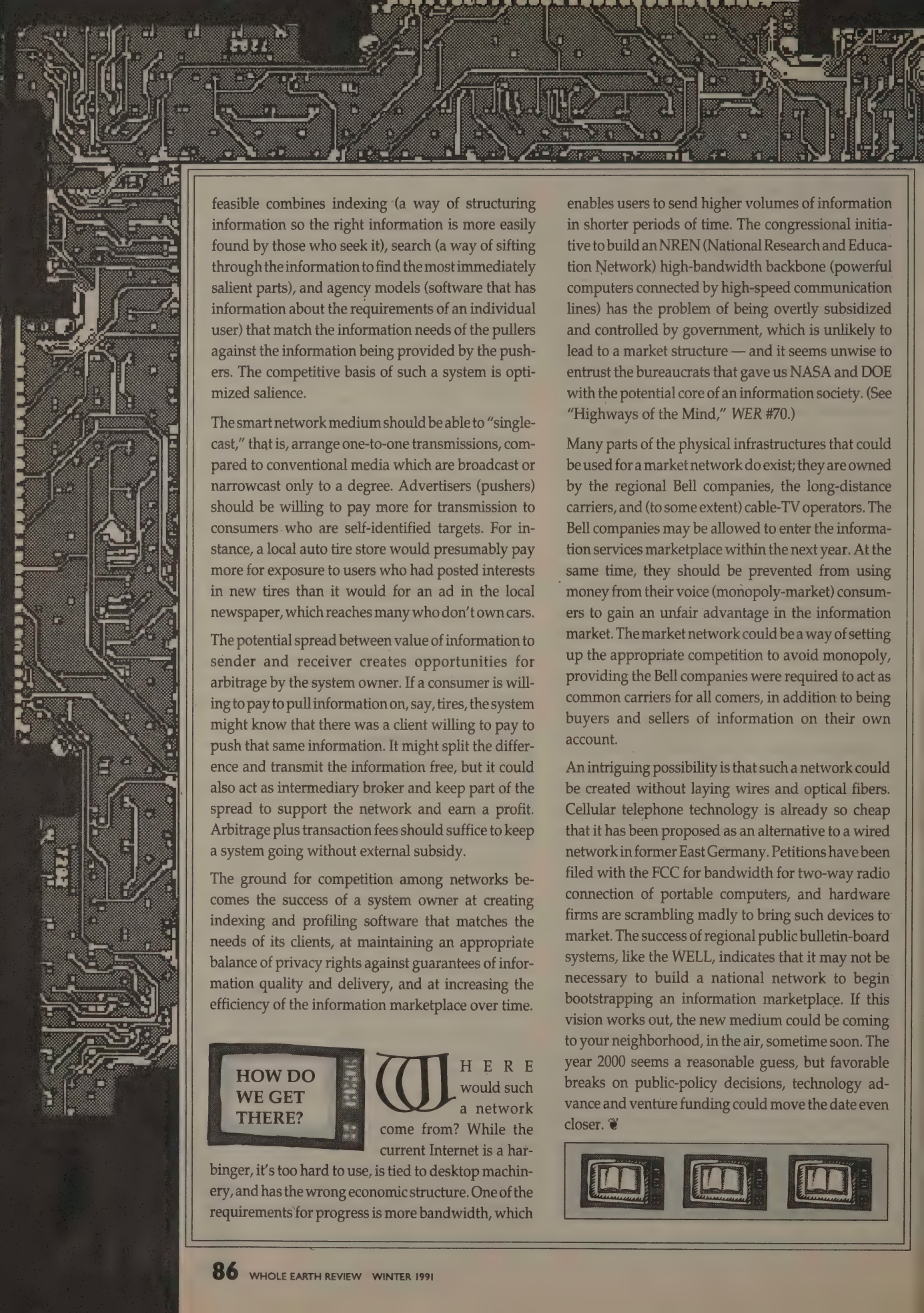
Like traditional media, these commercial networks have fixed themselves, their users, and all their transactions to one point in the value spectrum of push and pull. There is no structural reason why this must be so in a distributed electronic medium. Existing database and transaction-management systems are fully capable of mediating value exchanges among myriad parties — Visa and Mastercard do it every day.

THE NETWORK IS THE MARKET

A consumer information system needs to be a fully functional marketplace. Each user,

individual or corporate, should have the freedom to buy and sell push and pull information values. For instance, as a user I could choose to wholly subsidize my pull habit by letting others' push advertising take over three-quarters of my screen. I could publish a useful database online, and use part of the revenues from users' pull of that information to subsidize some push to others who might then become subscribers. I might remain effectively anonymous, or I might choose to make public some aspects of my information and material consumption habits so that relevant "pushers" would bid higher for my screen space.

The essence is the reduction in transaction costs between information value buyers and sellers. This requires arranging rendezvous between pushers and pullers in a manner more efficient than competing media. The technology that makes this efficiency



feasible combines indexing (a way of structuring information so the right information is more easily found by those who seek it), search (a way of sifting through the information to find the most immediately salient parts), and agency models (software that has information about the requirements of an individual user) that match the information needs of the pullers against the information being provided by the pushers. The competitive basis of such a system is optimized salience.

The smart network medium should be able to "single-cast," that is, arrange one-to-one transmissions, compared to conventional media which are broadcast or narrowcast only to a degree. Advertisers (pushers) should be willing to pay more for transmission to consumers who are self-identified targets. For instance, a local auto tire store would presumably pay more for exposure to users who had posted interests in new tires than it would for an ad in the local newspaper, which reaches many who don't own cars.

The potential spread between value of information to sender and receiver creates opportunities for arbitrage by the system owner. If a consumer is willing to pay to pull information on, say, tires, the system might know that there was a client willing to pay to push that same information. It might split the difference and transmit the information free, but it could also act as intermediary broker and keep part of the spread to support the network and earn a profit. Arbitrage plus transaction fees should suffice to keep a system going without external subsidy.

The ground for competition among networks becomes the success of a system owner at creating indexing and profiling software that matches the needs of its clients, at maintaining an appropriate balance of privacy rights against guarantees of information quality and delivery, and at increasing the efficiency of the information marketplace over time.

**HOW DO
WE GET
THERE?**

is binger, it's too hard to use, is tied to desktop machinery, and has the wrong economic structure. One of the requirements for progress is more bandwidth, which

enables users to send higher volumes of information in shorter periods of time. The congressional initiative to build an NREN (National Research and Education Network) high-bandwidth backbone (powerful computers connected by high-speed communication lines) has the problem of being overtly subsidized and controlled by government, which is unlikely to lead to a market structure — and it seems unwise to entrust the bureaucrats that gave us NASA and DOE with the potential core of an information society. (See "Highways of the Mind," *WER* #70.)

Many parts of the physical infrastructures that could be used for a market network do exist; they are owned by the regional Bell companies, the long-distance carriers, and (to some extent) cable-TV operators. The Bell companies may be allowed to enter the information services marketplace within the next year. At the same time, they should be prevented from using money from their voice (monopoly-market) consumers to gain an unfair advantage in the information market. The market network could be a way of setting up the appropriate competition to avoid monopoly, providing the Bell companies were required to act as common carriers for all comers, in addition to being buyers and sellers of information on their own account.

An intriguing possibility is that such a network could be created without laying wires and optical fibers. Cellular telephone technology is already so cheap that it has been proposed as an alternative to a wired network in former East Germany. Petitions have been filed with the FCC for bandwidth for two-way radio connection of portable computers, and hardware firms are scrambling madly to bring such devices to market. The success of regional public bulletin-board systems, like the WELL, indicates that it may not be necessary to build a national network to begin bootstrapping an information marketplace. If this vision works out, the new medium could be coming to your neighborhood, in the air, sometime soon. The year 2000 seems a reasonable guess, but favorable breaks on public-policy decisions, technology advance and venture funding could move the date even closer. ☺

WHERE would such a network come from? While the current Internet is a har-



The Telephone Book

My telephone rang many times while I was working my way through the typographic and conceptual thickets of **The Telephone Book**. In each instance, I couldn't ignore the sensation of being drawn into the plot.

A telephone call, according to the author, is a philosophical act. Who is calling? What do they want? Why me?

Avital Ronell's thesis is that communication technology has changed human beings so deeply, irreversibly, and suddenly that we are mesmerized, unable to recognize the changes wrought in our way of living in the world.

Certain philosophical thinkers, the author asserts, began to predict this change during the earliest years of the communication revolution. The connections are not direct, we are warned. We have to look at the philosophers obliquely, at the technologies through stories rather than equations, at our own lives as if we were characters in this book.

Woven into the analyses are biographical facts and imagined thoughts of the philosophers whose ideas are analyzed, overlaid and interpenetrated with footnotes, foreign words, deliberately misprinted pages, and weird page layouts.

Three historical telephone calls are central to the story:

On October 9, 1875, Alexander Graham Bell made the first long-distance telephone call, from Boston to Cambridge. It is seen here as a precise moment at which the power of the technological world floods into human history and changes it irrevocably.

In 1934, the philosopher Martin Heidegger, then rector of a German university, received a telephone call from the headquarters of the Nazi stormtroopers telling him to contribute in the removal of Jews from the faculty and curricula. Heidegger's acquiescence to the demands made by the Nazi leaders in that telephone call became a topic of controversy after the war, and the idea of a "call to Being," about which he had written thick tomes,

took on an interesting irony that is an important part of Ronell's argument.

Finally, in 1979, French philosopher Jacques Derrida was asked to accept a collect call from a "Martine or Martini Heidegger," which he refused on the grounds that it was a joke. Derrida, one of Heidegger's intellectual successors, whose work unleashed the kind of semi-otic, self-referential "deconstruction" that can be seen as a predecessor to **The Telephone Book**, did something Heidegger failed to do: he refused the call — or at least he said he did.

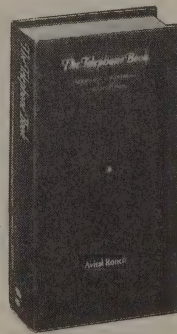
According to the author, those three telephone calls were nodes in a web of ideas, inventions, and power-relations that constitute a cryptic metaphysical infrastructure of the modern world. What Ronell offers is not so much a solution as a map strewn with surprising clues. Following the intellectual pursuit might be more important than discovering what lies at the end, for it forces the reader to look at the most mundane aspects of modern communication technology with the touch of terror they deserve.

The author might be onto something: the lack of an off-switch to technology is the

kind of idea that remains, and continues to disturb, after the book is closed. After you read this book, the sound of a ringing telephone, for example, will always have overtones you never heard before.

—Howard Rheingold

● **The Telephone Book** is going to resist you. Dealing with a logic and topos of the switchboard, it engages the destabilization of the addressee. Your mission, should you choose to accept it, is to learn how to read with your ears. In addition to listening for the telephone, you are being asked to tune your ears to noise frequencies, to anticonding, to the inflated reserves of random indeterminateness — in a word, you are expected to stay open to the static and interference that will occupy these lines. We have attempted to install a switchboard which, vibrating a continuous current of electricity, also replicates the effects of scrambling. At first you may find the way the book runs to be disturbing, but we have had to break up its logic typographically. . . . Respond as you would to the telephone, for the call of the telephone is incessant and unremitting. When you hang up, it does not disappear but goes into remission. This constitutes its Da-sein. There is no off switch to the technological.



The Telephone Book

(Technology, Schizophrenia, Electric Speech)

Avital Ronell,
1989; 466 pp.
\$20 (\$23.50
postpaid) from
University of
Nebraska
Press, 901 N.
17th Street, 327
Nebraska Hall,
Lincoln, NE
68588-0520;
800/755-1105
(or Whole
Earth Access)

the decisive disconnectedness in all language tracings. The speaking which appears as if disconnected from speaking and the speakers cannot therefore be used to explicate an essential dimension, gleaned from Heidegger, of schizophrenia in its most advanced stages of psychosis—unless, of course, Heidegger were himself to be implicated in the unfolding of a schizophrenogenic understanding of language. This would be going very far, on the other way to language, whose essential signposts read "Wrong Way, Do Not Enter." In another essay, "The Nature of Language," Heidegger has the following to say on the question, raised so often by the doctors, of not being there:

All in all, . . .
The way allows us to
reach what concerns us, in
that domain where we are
already staying. Why then,
one may ask, still find a way
to it? Answer: because
where we already are, we are
in such a way that of the
same thing we are not there,
because we ourselves have
not yet properly reached
what concerns our being, not
even approached it. The way
that lets us reach where we
already are, differing from
all other ways, calls for an
escort that runs far ahead.
(W 92-93)

In the same passage Watson deftly converts the fork as conveyor of food to a fork musically attuned. He makes the move from one paragraph to another, from the implement to the instrument. They are still building telephones. But Watson's immersion in the occult makes it hard for him to swallow the piano:

Bell had another fascination for me: he was a pianist, the first I had ever known. To play the piano had always seemed to me the peak of human accomplishment. It seemed so occult and inexplicable that I asked Bell one evening, when he was playing on his boarding-house piano, if it was necessary to hit the keys exactly in order to play a piece or would striking them anywhere in certain vicinities of the keyboard answer the purpose? My respect for the art was deepened when he said the precise key had to be struck every time. The possibility of my ever learning the art, which had been one of my secret aspirations, faded at this revelation of its unexpected difficulties.

HANDS-OFF TECHNOLOGY:

Four Books on Virtual Reality

BY
HOWARD
RHEINGOLD

The words "virtual reality" carry some kind of weird mojo. I'm convinced that part of the idea's appeal to some, and its horror

to others, lies in the way the phrase sounds like a metaphor for the "virtualization" of our lives through consumerism, resource extraction, and disinfotainment addiction. The words "virtual reality," without any reference to the underlying technology, are an ideal place to leap off into speculations about human-machine symbiosis, the metaphysics of virtual space, the mutation of privacy and fragmentation of identity in the info age, or the ethics of erasing the boundaries between a video game and a bombing run.

These are the four books I recommend to anybody who wants to know what VR technology is, where it came from, where it seems to be heading, and how it might affect us.

Virtual Reality is the first comprehensive look at the R&D and its implications; the bibliography is a good place to start exploring the literature in depth. It's a good place to go when you want to find out more about Myron Krueger and Brenda Laurel. I'm in the unique position for a reviewer of knowing what the author of this book would say differently if he were writing the book now.

The Gulf War, and the way it was presented in the media, crystallized some of my thinking about the ethics of VR weaponry. In *Virtual Reality* I traced the origins of head-mounted displays through 23 years of development for the USAF Supercockpit project; described what I saw of Simnet, the armored warfare simulator network for tank crews, jet pilots, and helicopter pilots; and provided a glimpse at a teleoperated humvee wielding a .50-caliber machine gun. But I did not foresee the marriage of simulation-as-training-tool to simulation-as-propaganda-weapon. The Gulf War showed how military leaders accomplished the virtualization of journalism by restricting the world's view of the combat to a few spectacular glimpses of video-game-like direct hits. Undoubtedly, the pilots and tank commanders in the Gulf War had trained in sophisticated computer graphics simulators that translated Defense Intelligence Agency maps of Kuwait and Iraq into virtual battlefields where planned maneuvers could be rehearsed electronically. The Gulf was the first virtual war.

The question that arises now concerns

• One way to see VR is as a magical window onto other worlds, from molecules to minds. Another way to see VR is to recognize that in the closing decades of the twentieth century, reality is disappearing behind a screen. Is the mass marketing of artificial reality experiences going to result in the kind of world we would want our grandchildren to live in? What are the most powerful, most troubling, least predictable potentials of VR? If we could discern a clear view of the potentials and pitfalls of VR, how would we go about optimizing one and avoiding the other? The genie is out of the bottle, and there is no way to reverse the momentum of VR research; but these are young jinn, and still partially trainable. We can't stop VR, even if that is what we discover is the best thing to do. But we might be able to guide it, if we start thinking about it now.

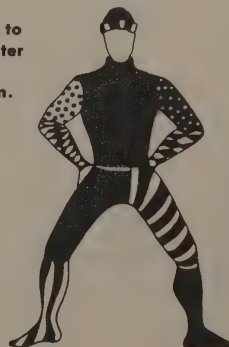
—*Virtual Reality*

• *Technology for Fun*
More important than the specific knowledge a person may gain about technology is the attitude toward technology that is conveyed by an artificial-reality exhibit. The interactive exhibit is technology for fun. Americans are incredibly attuned to the idea that the sole purpose of technology is to solve problems. We seem unable to grasp that only by completely integrating our technology with the whole of our lives can we understand its implications sufficiently to use it with confidence. In

1982, well before the collapse of the video-game industry or its resurgence led by Nintendo, I wrote "Consequently, with the recent and probably temporary exception of video games, we buy entertainment equipment almost exclusively from other countries which are better able to see the implications of our inventions in terms of day-to-day life." This sentence reflected my awareness that American businesspeople have a distaste for technology products that are used by individuals, as opposed to those used by organizations.

Artificial realities also illustrate ways that technology can be personalized and humanized. It is possible to program an interactive environment so that each person has a dramatically different experience, not only because each acts differently, but also because the relationships that govern the interaction are different.

A costume to aid computer pattern recognition.



Finally, in an exciting and frightening way, interactive exhibits dramatize the extent to which we are savages in the world that our technology creates. Contemporary laypeople are probably more ignorant of their culture's technology than have been any people in human history. The layperson has extremely little ability to define the limits of what is possible with current technology, and so will accept all sorts of cues as representing relationships that do not in fact exist. The constant birth of such superstitions indicates how much we have already accomplished in mastering our natural environment, and how difficult the initial discoveries must have been.

—*Artificial Reality II*

• Art is time travel; it transmits understanding across time and space. Carvings and sculptures, houses and temples, plays and symphonies are asynchronous conversations between the makers of a work and those who experience it. But the experience of art is in the here and now. Realtime is where the conversation takes place and where illumination is achieved. In this way, art itself is "telepresence." From the plays of ancient Greece to the ritual dances of the Anasazi to the concerts of the Grateful Dead, realtime experience is the Dionysian dimension of art. Recall that in the Greek theatre, actors were the priests of Dionysus, the god of ecstasy and rebirth, and during the act of performance they felt themselves to be in possession of the god. Their audiences were transported and il-

the potential effects of blurring the line between war and video games. VR is a promising tool in science, medicine, engineering, the arts; at the same time, there is no reason to suspect that the eventual entertainment applications won't be part of the same process that brought us Disneyworld, happy-talk news, sound bites, and television addiction. Now we have semiautonomous weaponry to worry about. People once applauded the advent of television as the dawn of a new age of universal education; we now know that the commercial television brand of education is "Wheel of Fortune," "Dallas," Johnny, Donny, and Geraldo. What kind of horseshit will somebody try to sell us, using VR, once the technology matures into a mass medium? A look back through the history of television, tobacco, alcohol, and slave trades ought to provide more of a cautionary hint than I provided.

Myron Krueger is a central character in anybody's history of VR, and a continuing force in the current development of the field. Copies of his out-of-print 1983 book, *Artificial Reality*, were coveted, hoarded, and circulated among the first wave of VR researchers. I glance guiltily

at my bookshelf, where Brenda Laurel's copy still resides. The new edition, *Artificial Reality II*, carries Krueger's basic ideas — that human response is the deepest new medium offered by the computer, that the environment should be responsive rather than requiring people to wear headgear and gloves, that art is the proper mode of exploring the implications of human-computer action — into the age of glove-and-goggle VR technology. The man has been thinking about, building, studying, and evolving responsive environments for more than twenty years and he knows today's technologies as well as anyone. If you don't read his book, and you intend to build or discuss VR technology, you are doomed to reinvent, misapprehend, or overlook the wheel.

Brenda Laurel, another notable character in the history of VR, is now in partnership with NASA VR pioneer Scott Fisher in a startup VR company, Telepresence Research. In *Computers as Theatre*, Laurel continues the tradition of stretching the imagination of computer designers by coming up with a new metaphor for what they are doing. The next stage of human-computer interaction includes

more direct coupling between the human body and the computer, including VR and teleoperation, automatic gesture recognition and head tracking, voice commands. Laurel demonstrates how theater is a human activity that might help us understand and shape the virtual worlds to come.

VR is part of cyberspace, but cyberspace is bigger. As John Perry Barlow puts it, "Cyberspace is where your money is." Michael Benedikt, architecture professor at the University of Texas, convened the First Conference on Cyberspace in Austin, in May 1990. That conference was where I first heard Barlow expound on what some now call "Barlovian cyberspace," and where I first met Sandy Stone, author of "Sex and Death Among the Disembodied." *Cyberspace: First Steps* grew out of that conference, and I can see that the editor and this eclectic group of programmers, philosophers, architects, social scientists, artists, and business planners took pains to fill out the theories, visions, models, and cautionary tales they presented in Austin. *Cyberspace* is a smorgasbord of theoretical frameworks for the artificial worlds we seem to be creating. □

luminated by the divine presence. Dionysian experience is the experience of being in the living presence of not only the artist but also huge spiritual forces.

I think we can someday have Dionysian experiences in virtual reality, and that they will be experiences of the most intimate and powerful kind. But to do so we must breathe life into our tools. Our creative force must be manifest, not as an artifact but as a collaborator — an extension of ourselves embodied in our systems. There must be more behind the looking glass than a room that one steps into, and there must be more to virtual reality than the engineering of the looking glass.

For virtual reality to succeed in meeting these goals, we need continual and deep involvement by artists in the ongoing process of understanding what virtual reality is for and what it can be. We need convivial tools that allow artists to work in the medium in order to influence its evolution. Most of all, we need artists to help us understand how virtual reality, like other art forms, can inform and enrich human experience. —*Computers as Theatre*

• Lucasfilm's Habitat project was one of the first attempts to create a very large-scale, commercial, many-user, graphical virtual environment. A far cry from many laboratory research efforts based on sophisticated interface hardware and tens of thousands of dollars per user of dedicated

computing power, Habitat is built on top of an ordinary commercial on-line service and uses an inexpensive — some would say "toy" — home computer to support user interaction. In spite of these somewhat plebeian underpinnings, Habitat is ambitious in its scope. The system we developed can support a population of thousands of users in a single shared cyberspace. Habitat presents its users with a real-time animated view into an on-line simulated world in which users can communicate, play games, go on adventures, fall in love, get married, get divorced, start businesses, found religions, wage wars, protest against them, and experiment with self-government.

The Habitat project proved to be a rich source of insights into the nitty-gritty reality of actually implementing a serious, commercially viable cyberspace environment. Our experiences developing the Habitat system, and managing the virtual world that resulted, offer a number of interesting and important lessons for prospective cyberspace architects. —*Cyberspace* ■



Artificial Reality II

Myron W. Krueger, 1991; 286 pp.

\$26.95 (\$29.45 postpaid)

Computers as Theatre

Brenda Laurel, 1991; 211 pp.

\$29.95 (\$32.45 postpaid)

Both from Addison-Wesley Publishing Co./Order Dept., 1 Jacob Way, Reading, MA 01867; 800/447-2226 (or Whole Earth Access)

Cyberspace: First Steps


Michael L. Benedikt, Editor. 1991; 431 pp.

\$24.95 (\$27.95 postpaid) from The MIT Press, 55 Hayward Street, Cambridge, MA 02142; 800/356-0343 (or Whole Earth Access)

Virtual Reality

Howard Rheingold, 1991; 415 pp.

\$22.95 (\$25.95 postpaid) from Simon & Schuster, 200 Old Tappan Road, Old Tappan, NJ 07675; 201/767-5937 (or Whole Earth Access)



Privacy & Technology



BY GARY T. MARX

IN THE UNITED STATES we recently celebrated the two-hundredth anniversary of the Constitution, a document that extended liberty. Unfortunately, the bicentenary of another important document that restricted liberty has gone virtually unnoticed — the 1791 publication of Jeremy Bentham's *Panopticon; or, the Inspection House*.

Bentham offered a plan for the perfect prison, in which there would be constant inspection of both prisoners and keepers. His ideas helped give rise to the maximum-security prison. Recent developments in telecommunications, along with other new means of collecting personal information, give Bentham's image of the panopticon great contemporary significance.

The stark situation of the maximum-security prison can help us understand societal developments. Many of the kinds of controls and information-gathering techniques found in prison specifically and the criminal justice system more broadly are diffusing into our culture. We may well be on the road to becoming a "maximum-security society." Such a society is transparent and porous. Information leakage has become rampant; indeed, it is hemorrhaging. Barriers and boundaries — be they distance, darkness, time, walls, windows, or even skin — that have been fundamental to our conceptions of privacy, liberty, and individuality are giving way.

In such a society, actions, feelings, thoughts, pasts, and even futures are made visible — often without the individual's will or knowledge. The line between the public and the private is being obliterated; we are under constant observation, everything goes on permanent record, and much of what we say, do, and even feel may be known and recorded by others whom we do not know — whether we will this or not and even whether we know about it or not. Data in many different forms and coming from widely separated geographical areas, organizations, and time periods can be merged and analyzed easily.

As the technology becomes ever more penetrating and intrusive, it becomes possible to gather information with laserlike specificity and spongelike absorbency. If we visualize the information-gathering process as a kind of fishing net, then the net's mesh has become finer and the net wider.

Just as free association led to discovery of the unconscious, new techniques reveal bits of reality that were previously hidden or contained no informational clues. When their privacy is invaded, people are in a sense turned inside out, and what was previously invisible and meaningless is made tangible and significant.

It is easy to get carried away with science-fiction fantasies about things that might happen. But we need not wait for the widespread use of videophones, paperless electronic safety-

deposit boxes, wafer-thin portable personal communications devices, satellite monitoring of individuals via implanted transmitters, or DNA fingerprinting and other forms of biometric monitoring to note profound changes in the ease of gathering personal information. Consider the following:

A college student secretly videotaped sexual encounters with a girlfriend. After breaking up with her, he played the tape for members of his fraternity. She learned of this and was victorious in a civil lawsuit, although no criminal statute had been violated.

Teachers in a school lounge were complaining about their principal,

Gary T. Marx is a professor of sociology at M.I.T. His latest book is Undercover: Police Surveillance in America (University of California Press, 1988). This piece is excerpted from a longer article published in The World and I, September 1990.
—Howard Rheingold

when one jokingly said, "Be careful, the room might be bugged." Just then they spotted a transmitter in the ceiling, which in fact had been hidden there by the principal.

During a toy manufacturer's television ad, a clown asked children to place their telephone receivers in front of the TV. The studio then broadcast dialing tones that called an 800 number, which resulted in kids dialing the number. The 800 number called had automatic number identification service and recorded the children's phone numbers. The purpose was to create marketing lists.

A friend went on vacation. On returning he had only one message on his answering machine. Shortly after his departure, a synthesized voice "interviewer" had called to ask if he would consent to being interviewed. Since he did not hang up, the system assumed he had agreed to be interviewed and proceeded to ask him a series of questions, pausing after each to let him answer. The interview consumed the full length of the answering machine's tape. In several cases citizens have won lawsuits because

during an emergency, an automated dialer had captured their line and could not be disconnected, making it impossible to dial 911.

In Iowa, a woman overheard a neighbor's cordless-phone conversation on her FM radio. She was suspicious of the call and informed police. They instructed her to continue to listen and to record his conversations, all without a warrant, which she did for more than a year. The Supreme Court has ruled that such eavesdropping is permissible.

A variety of personal communication devices, such as cordless and cellular phones and room monitors for infants, can be intercepted easily (and often legally) by scanners, FM radios, and older TV sets with UHF channels. Cordless phones using the same frequency may also pick up wireless communication. Speakerphones may amplify communication. A conversant can never be sure who is listening. In a recent example President Bush was unaware that his off-the-cuff remarks were overheard by a large audience listening in via a speakerphone.


***The line between
the public and the
private is being
obliterated; we are
under constant
observation,
everything goes on
permanent record,
and much of what we
say, do, and even feel
may be known and
recorded by
others whom we do
not know — whether
we will this or not
and even whether we
know about it or not.***

Work monitoring has been taken to new heights, or depths, depending on your point of view. Quantity of key-stroke activity, number of errors and corrections, speed of work, and time away from the computer can be measured. Programs such as CTRL and SPY permit remote secret monitoring of a target's personal computer use when his terminal is attached to a larger system. A permanent record of the intercepted terminal's input and output can be made. There is also the possibility of "initial screen repaint," which permits the watcher to see what was on the target's screen before the SPY program was activated. The headsets used by telephone reservationists can be converted to microphones to permit remote monitoring of all office conversation by a supervisor many floors, or even miles, away.

Home phones can be made "hot on the hook": An "infinity transmitter," whether attached to a telephone or part of an answering machine, converts the phone into a microphone. The individual who dials in (the phone does not ring) is able to listen to what is being said in the room.

The US commissioner of immigration has proposed a nationwide computer system to verify the identities of all job applicants. An FBI advisory board recently recommended putting the names of those suspected of (but not arrested for) crimes into a nationally accessible database, as well as the names of the friends and associates of known criminals. The director of the FBI rejected the proposal. Yet pressures to create such national databases are strong.

Marketing researchers are gathering ever more detailed data and carrying out increasingly fine-grained analysis. For example, supermarkets use the itemized bills made possible by bar coding to collect unprecedented information about consumers. Such information (when combined with the personal data consumers provide for checkcashing privileges) is easy to analyze and sell. There is often more to mailed promotional coupons than meets the eye — "invisible" personal data (name, address and other demographic information) may be in the bar code or elsewhere. The behavior of customers who agree to use "frequent shopper cards" is monitored closely, and it will be possible to market directly to households, using



coupons to steer them toward products with higher profit margins. Consumer behavior also can be linked to exposure to specific ads seen on cable television. Persons on the same block watching the same channel may receive different versions of the ad being tested.

Lotus Corporation proposed a new product called "Marketplace," to be available at retail software stores. Its database contained information such as name, address, age, gender, marital status, and estimates of income, lifestyle, and buying habits of 80 million households. The 120 million consumers contained in the database were not asked if they wished to have their personal transactional information treated as a commodity; they would not have been compensated for its sale, nor could corrections easily have been made. The product was withdrawn after massive public protest.

It is easy to imagine how marketing lists might be misused. Purchasers of pregnancy-testing kits may receive solicitations from pro- and anti-abortion groups, or from sellers of birth-control products and diaper services. Purchasers of weight-loss products or participants in diet programs may be targeted for promotional offers from sellers of candy, cookies and ice cream, or, conversely, those whose purchases of the latter exceed the average may receive offers for weight-loss products and services. Subscribers to gay and lesbian publications may be targeted by religious and therapeutic organizations, or face employment denials, harassment, and even blackmail. Frequent travelers and those with multiple residences may receive solicitations from sellers of home-security products, and such lists would be a boon to sophisticated burglars. A list of tobacco users might be of interest to potential employers and insurance companies. A list of those with credit troubles and excessive indebtedness would certainly be of interest to promoters of scams that promise to help people obtain credit cards or get out of debt. A cynic might even hypothesize that such a list would be used by promoters of alcoholic beverages, sweepstakes advertising, and gambling junkets.



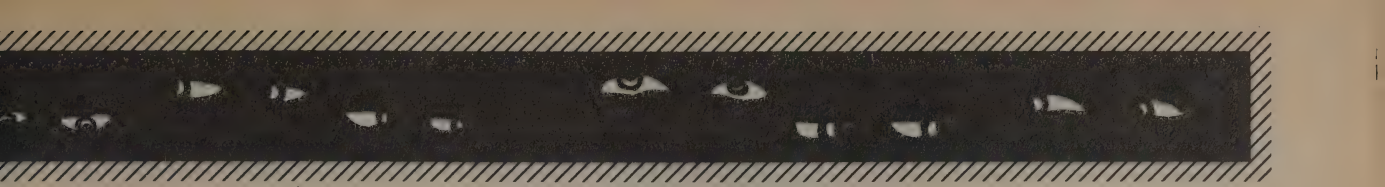
THE PREVIOUS EXAMPLES raise a variety of troubling issues: injustice, intrusion, denial of due process, absence of informed consent, deception, manipulation, errors, harassment, misuse of property, and lessened autonomy. But running through most of the examples is the central issue of privacy, as it relates to the control of personal information.

Given these examples and potential problems, it is not surprising that in 1989 half the population thought new laws were needed to protect personal privacy. Yet in a country fascinated by technology, committed to free enterprise and freedom of speech, and concerned over declining productivity, AIDS, crime, drugs, and terror, there are also contrary voices.

Those unconcerned about privacy remind us that we live in an open society that believes that visibility in government brings accountability. With respect to individuals, a valued legacy of the 1960s is personal openness and honesty. The only people who worry about privacy are those who have something to hide. Right?

A response to privacy concerns, expressed by some industry spokespersons, columnists, and citizens, is simply, "So what? Why worry?" In their view, these technologies fill deeply felt needs. A host of arguments is offered to bolster their position: We increasingly live in a world of strangers, rather than in homogeneous rural communities where all residents know each other. The Supreme Court in the *Katz* decision has said that privacy was protected only when it could be reasonably expected. Technology changes and social expectations can't remain static. With more powerful technologies we can reasonably expect less and less, and hence privacy must become more restricted. After all, they say, most so-called privacy invasions are not illegal, and given the free market, one can buy technologies to prevent privacy invasion. For that matter, personal information is just a commodity, to be sold like any other. Companies have an obligation to stockholders to make money. Protecting privacy is expensive and can deter innovation.

Consumers, too, are demanding personalized and customized services. Mass marketing is inefficient, and economic viability requires the "pinpoint" or "segmented" marketing that computer analysis now makes



possible by using "point-of-sale" information. It is up to government to use whatever means it can to be more efficient and to find the guilty and protect the innocent.

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IT HAS BEEN SAID that a civilization's nature can be seen in how it treats its prisoners; it might also be seen in how it treats personal privacy.

Noting the social functions of privacy certainly is not to deny that privacy taken to an extreme can be harmful. Nor should the right to privacy infringe on other important values, such as the public's right to know and the First Amendment guarantees.

Unlimited privacy is hardly an unlimited good. It can shield irresponsible behavior — protecting child- and spouse-abusers, unsafe drivers, and money-launderers. Taken too far, it destroys community. Without appropriate limitations it can trigger backlash, as citizens engage in unregulated self-help and direct action. The private subversion of public life carries dangers, as does the public intrusion into private life.

Contemporary information-extractive technologies can, of course, protect liberty, privacy, and security. Without the incriminating tapes secretly recorded by President Nixon, Watergate would have remained a case of breaking and entering; without the Xerox machine, the Pentagon Papers might never have reached the public; and without the backup computer records kept in NSC files that Oliver North thought he had erased, we would know far less about the Iran-Contra affair. Aerial surveillance can monitor compliance with pollution standards and help verify arms-control treaties. Tiny transmitters can help locate lost children or hikers caught in an avalanche. Devices that permit firefighters to see through smoke may save lives, and remote health monitors can protect the elderly living alone (in one type, an alarm is sent if a day goes by without the refrigerator being opened).

But elements of Greek tragedy are present: the technology's unique power is also its tragic flaw. What serves can also destroy, absent increased public awareness and new public policies.

An important example of the kind of principles and policies needed is the Code of Fair Information developed in 1973 for the U.S. Department of Health, Education, and Welfare. The code involves five principles:

- There must be no personal-data recordkeeping whose very existence is secret.
- There must be a way for a person to find out what information about him is in a record and how it is being used.
- There must be a way for a person to prevent information about himself that was obtained for one purpose from being used or made available for other purposes without his consent.
- There must be a way for a person to correct or amend a record of identifiable information about himself.
- Any organization creating, maintaining, using, or disseminating records of identifiable personal data must assure the reliability of the data for their intended use and must take precautions to prevent misuses of the data.

These ideas might be built upon. Ways to do so include establishing a principle of *minimization*, such that only information directly relevant to the task at hand is gathered; a principle of *restoration*, such that in a communications-monopoly context, those altering the privacy status quo should bear the cost of restoring it; a *safety net* or *equity* principle, such that a minimum threshold of privacy is available to all; a principle of *timeliness*, such that data are expected to be current and information that is no longer timely should be destroyed; a principle of *joint ownership of transactional data*, such that both parties to a data-creating transaction must agree to any subsequent use of the data and must share in any gains from its sale; a principle of *consistency*, such that broad ideals rather than specific characteristics of a technology determine privacy protection; and a principle of *redress*, such that those subject to privacy invasions have adequate mechanisms for discovering and being compensated for violations.



IT IS NOT a foregone conclusion that developing technology will reduce the power of the individual relative to large organizations and the state, although the forces favoring this outcome tend to be stronger than those opposing it.

Schools and religious organizations should deal more directly with the individual's rights with respect to means such as third-party records, computer dossiers, drug testing, and the polygraph. It is important that citizens react to invasions of privacy by questioning organizations, rejecting assertions such as "the computer says" or "that is the policy." Why is it the policy? What moral and legal assumptions underlie it? What alternatives are there? How were the data gathered? How are they protected and used?

It is also important that the technology be demystified and that citizens not attribute to it nonexistent powers. There is a chilling danger in the myth of surveillance, and when tech-

nologies are revealed to be less powerful than authorities claim, legitimacy declines. There should be truth in communications policies, just as we have truth in advertising and loan policies. The potentials and limits of the technology must be understood.

There are a number of steps that individuals can take to protect privacy:

- Don't give out any more information than is necessary. You are legally required to give out your social-security number in only a few instances. Don't answer questions that seem irrelevant to the issue at hand. (For example, you may refuse to give your phone number when making a credit-card purchase, or family and income information when filling out a warranty card.)
- Don't say things over a cellular or cordless phone or baby monitor that you would mind having overheard by strangers.
- Ask your bank to sign an agreement that it will not release information about your accounts to anyone lacking legal authorization. It should state that in the event of legal authorization, the bank will notify you within two days.
- Obtain copies of your credit, health, and other records and check for accuracy and currency. You are entitled to know what is in many records and, if you dispute the information, to add your version. Credit records can be obtained from TRW, Equifax, and Trans Union. Medical records can be obtained from the Medical Information Bureau (a databank maintained by 800 insurance companies), Box 105, Essex Station, Boston, MA 02112.
- If you are refused credit, a job, a loan, or an apartment, ask why. There may be a file with inaccurate, incomplete, or irrelevant information.
- If you think you are being investigated by a federal agency or believe the agency has a file on you, submit a Freedom of Information Act request asking to see the file.
- If you think your telephone is tapped or a bug is being used and you find evidence of eavesdropping equipment, contact the police and an attorney. Make use of technologies that can protect your privacy, such as an answering machine.
- Realize that when you respond to telephone or door-to-door surveys, the information will go into a databank. The only federal survey that most persons are legally obliged to answer is the U.S. Census.

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- When you purchase a product or service and file a warranty card or participate in rebate or incentive programs, your name may well be sold to a mailing-list company. Ask that it not be circulated.

The Privacy Protection Act of 1974 refers primarily to actions at the federal level and tends to exclude state, local, and private-sector activities. A major failing of the Privacy Act is weak-to-nonexistent discovery and enforcement mechanisms. It is unrealistic to expect most individuals to discover violations, given the hidden and complex nature of much data collection and exchange. The means of locating violations and enforcing standards needs to be strengthened. However, the Office of Management and Budget has given this task a low priority.

The Fair Credit Reporting Act offers no recovery if a consumer is hurt by a technically accurate but misleading report. It is important that there be provision for injunctive relief for damages for persons who suffer intangible harm as a result of privacy invasion and that incentives be created that will increase compliance with the legislation we do have.

Unlike many European countries, the United States does not attempt to regulate data collection. Most protections pertain to how data are treated once they are collected. The First Amendment and concern over creating another regulatory bureaucracy partly explain this situation, but as a consequence, citizens are on their own in discovering and bringing action when their rights are violated and data collectors are given a free hand in gathering information. Given the low visibility of many violations and citizens' lack of knowledge of their rights, laws here are underenforced.

A variety of new federal, state, and local initiatives are needed. Among the promising federal legislation introduced, though not passed, as of 1990 are a bill to extend the protections of the Fair Credit Reporting Act to tenant-screening services; a bill to require a periodic audible beep on phones being monitored; a bill to extend the warrant protection of aural surveillance to video; and a bill to eliminate single-party-consent eavesdropping (a major loophole) so that all parties to a recorded conversation would have to agree.

While the Constitution has implications for privacy in a number of places (in the First, Third, Fourth, Fifth, and Fourteenth Amendments, among others), there is no explicit amendment guaranteeing privacy. States such as California

and Pennsylvania have such protections. The United States might emulate countries such as Switzerland, Sweden, Italy, and Portugal by drafting a constitutional amendment protecting privacy. The challenge is to draft it in a general enough way to protect what needs to be protected, without creating a statute whose vagueness sheeters things the public interest requires to be revealed. That such a law might be largely symbolic would not detract from its significance.

With respect to information-gathering technology, we are now in the twilight zone that Justice William O. Douglas wrote about in arguing that the protection of our basic values is not self-executing:

"As nightfall does not come at once, neither does oppression. In both instances, there is a twilight when everything remains seemingly unchanged. And it is in such twilight that we all must be most aware of change in the air — however slight — lest we become unwitting victims of the darkness. One could as well argue that we are in a sunrise zone, and that we must be aware of change in the air in order to insure that we all profit from the sunshine. But for this to happen the technology must be bounded by increased public awareness, responsible corporate and government behavior, and new laws and policies." ☺

From Satori to Silicon Valley

Theodore Roszak, the man who coined the word and the idea "counterculture," has come out with an eloquently written, tightly argued little book that brings together the counterculture of the sixties with the cyberculture of the seventies and eighties. Originally delivered as the 1985 Fine Lecture at San Francisco State University, *From Satori to Silicon Valley* has all the advantages of an oral presentation: not too long, not freighted with dozens of footnotes, yet offering a clear vision of what ties together the psychedelic and visionary impulses of the Haight-Ashbury and the high-tech thrust of computer culture. Anyone interested in the genesis of Bay Area visionary culture and/or computers should read this book. If you're an uncritical flagwaver for the digital revolution, be forewarned: though not as devastating as Roszak's *Cult of Information*, this book paints a somber picture of what became of hippie and hacker ideals as the world of international business absorbed them into its vastly older and more powerful domains. In the struggle between what Roszak calls the "reversionaries" — back to nature and the organic way, down with the military-industrial complex! — and the "technophiles" — better living through chemistry and the digital solution to world problems! — one side won and the other lost. We are living with the consequences of these victories and defeats right now, and will be for years to come.

—Arthur Chandler

It was an attractive hope that the high technology of our society might be wrested from the grip of benighted forces and used to restore us to an idyllic natural state. And for a brief moment — while the

music swelled, and the lights flashed, and the dope cast its spell — it looked like the road forward to many bright spirits. But ultimately — and really in very short order — the synthesis crumbled, and the technophilic values of the counterculture won out. They are, after all, the values of the mainstream and the commanding heights, forces that have proved far more tenacious than most members of the counterculture guessed.

Tough Questions • Student Pugwash USA

In 1957, Albert Einstein and Bertrand Russell called upon the world's scientists and citizens to "learn to think in a new way." To that end, a conference was held in Pugwash, Nova Scotia, bringing together academics and policy advisers to propose ways to curb the nuclear arms race. Student Pugwash USA (SPUSA) draws its inspiration from the Pugwash Conferences. Where the original Pugwash Conferences concentrated on nuclear weapons, SPUSA takes a broader view, providing high-school and university students and recent graduates with educational programs organized around understanding the social and ethical implications of technology. *Tough Questions* is SPUSA's quarterly publication.

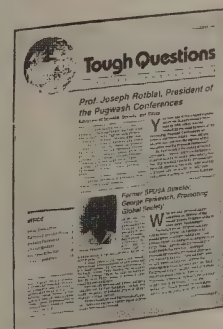
—Howard Rheingold

Student Pugwash USA programs address the fact that science and technology are shaping the world in increasingly profound ways. We recognize that if society is to avoid thoughtless applications of technology in the future, it is first critical to train young people to consider the implications of their decisions. Scientists and engineers

From Satori to Silicon Valley

Theodore Roszak, 1986; 60 pp.

\$3.95 (\$5 postpaid) from Lexikos Publishing, P. O. Box 296, Lagunitas, CA 94938; 415/488-0401 (or Whole Earth Access)



Tough Questions

Free from Student Pugwash USA, 1638 R Street NW/Suite 32, Washington, DC 20009-6446; 202/328-6555



Genes, Genius, And Genocide

BY JASON CLAY



*Modern technology's relentless consumption of the Developing World is producing one interesting side effect: a belated and growing respect for native cultures. Hollywood makes Indians the good guys in *Dances With Wolves*. Archaeological officialdom evolves beyond grave-robbers with Ph.D.s, and museums actually begin to give bones and artifacts back to the tribes they were taken from. But what about the living, what about tribal cultures that understand and preserve entire ecosystems by virtue of having learned how to live in them sustainably? Do they have rights to the useful things found in their world once those things leave it?*

Jason Clay argues that they should. He is the marketing director of Cultural Survival Enterprises, an attempt to create an ethical middleman for marketing sustainably harvested nontimber rainforest products to First World consumers. This article ran as an editorial in Cultural Survival Quarterly. For information or a subscription, contact Cultural Survival, Inc., 53A Church Street, Cambridge, MA 02138; 617/495-2562.

—Richard Nilsen

THE LAST GREAT RESOURCE RUSH HAS BEGUN. It's not land, minerals, timber, or water that are at stake. This time, it's genes, and how to use them. The most genetically diverse areas of the world are inhabited by indigenous peoples. Their areas, and their knowledge, are once again being mined — for information. Unless indigenous rights to this material and knowledge are respected, this gene rush will leave indigenous people in the same hole as the other resource rushes.

The genetic materials in question make up the building blocks of life. The advent of genetic engineering has intensified the search for genes that can be used to make existing food crops hardier or more nutritious, and for new, more advanced foods and medicines.

Indigenous residents hold the keys to these remote, biologically diverse areas. Their knowledge is the genius that unlocks the genes, often shortcutting decades of costly research and experimentation.

Genetic diversity and local knowledge about its useful properties will pave the way for all humans to adapt to changing circumstances. This is why maintaining the world's genetic diversity and recognizing those who are most familiar with interpreting it are so important. However, this gene rush, merely the latest in a series of assaults on the Earth's resources, will not help biological diversity.

The destruction of the world's biological diversity is related as much, if not more, to poverty as it is to greed. The current rush to discover genetic resources shows no signs of alleviating poverty. The fundamental question is, Who rightfully owns the wide variety of genetic materials currently in demand? Ownership and wealth go hand in hand: if you own something, you can sell it to generate income.

Ownership is an extremely complicated issue, however. Rights to genetic material should depend, to some extent at least, on having knowledge of, maintaining, and manipulating it. Here are a few examples.

If an indigenous group has created a compound of two or more plants that produces known and predictable pharmacological effects, then that group should have as many rights to its discovery — even though it may have taken generations to perfect — as would any scientist or research team in any university or corporate lab.

Likewise, if, over the centuries, a group has used a plant for a specific purpose and has selected it for specific properties, thereby changing the plant from its wild state through such use, then that group should have rights to the "new" plant.

These rights — the more obvious rights that indigenous people should have — are not respected, much less guaranteed, anywhere in the world today. Missionaries working with an indigenous group in western Brazil are reported to have recently taken a sample of an arrow poison compound made by the group and given it to botanists who were conducting inventories of possibly useful plants. The botanists then passed a sample of the arrow poison on to a large, US-based chemical company, the supporter of their research. The company reportedly took out a patent on the poison's muscle-relaxant properties — precisely the properties that made the poison effective for use in hunting. The indigenous group did not receive a cent of royalties, and its rights to the material were not acknowledged in any way. While this "transfer" was taking place, half of the indigenous group's land was seized by the Brazilian government. Patenting the group's knowledge neither benefited the group nor protected the region's biological diversity.



There are other, even grayer areas where indigenous people should arguably have rights to their resources. Under British law, for example, one can make the case that people have rights to materials that they have allowed to flourish, even if they have never utilized them.

By extension, then, indigenous people, in maintaining the world's rainforests and other fragile ecosystems, have rights to any resources discovered there. As the logic of the argument goes, if the groups had not served as guardians of the resource base, it would have disappeared long ago. In this light it would be difficult for any Third World state to stake a claim to the rights of genetic resources existing within its borders. Most of these states (e.g., Brazil, Ethiopia, Malaysia) have done everything they can to develop the resources to death.

This is not to deny other parties' legitimate claims or rights to genetic knowledge. Scientists, corporations, and states alike can incur considerable costs in bringing new materials onto the market. To date, however, indigenous people's rights to either the basic raw materials or to the knowledge that often unlocks their use has been consistently denied. This imbalance must change.

The 1990s have already seen the rise of nationalism and the assertion of local, group control over resources. Genetic material and knowledge are certain to become part of these resources. If we are serious about our desire to protect the world's most fragile ecosystems and most endangered peoples, then we must ensure that these groups be allowed — both legally and economically — to continue to protect fragile areas, as they have done for generations. ☛

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Rush to Burn

Garbage piling up into mountains as landfills close. Landfills leaking toxins into the groundwater. Oceans burping disgusting glop onto beaches. This magazine usually refrains from reviewing cries of outrage and despair well served elsewhere. But the garbage problem has proven to be uniquely intractable to easy solutions. Some people — including certain environmentalists — think one answer is to burn the stuff, which can have the added advantage of replacing fossil fuel to make steam for the turbines of electrical generating plants. That strategy is a typical example of a "technological fix" for problems rooted in technology. But is burning a good idea? For one thing, it actually gives value to garbage — the more the better.

What to do? The idealistic "make less garbage" and recycling have so far not done much good. The only long-term answers mean major changes across our entire society, and others around the world. It may well be that the garbage problem will spur the first major battle between Earth-trashers and Earth-stewards — metaphorically the first unhidable skirmish of world war III. This multifaceted book uses a wonderful mix of real-life examples to show that we are at last forced to more rigorous standards of honesty, regardless of political expediency. Strong stuff. —J. Baldwin

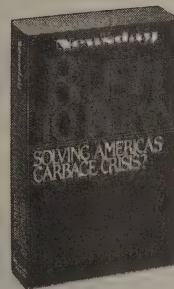
■ Jorie MacKinnon offers a prophetic warning. "Without question, anything that you just don't want to know about is going to come back and get you."

■ When Oyster Bay's landfill closed in 1986, it shipped its garbage 160 miles to the Scranton, Pennsylvania, area. A year later, it was forced to go as far as the woodlands of southern Michigan, 635 miles away, and the bluegrass hills of western Kentucky, an 850-mile odyssey, to find landfills that would take Long Island trash.

To cut costs at those distances, East Coast haulers are shipping out garbage on interstate trucks that come from the Midwest carrying consumer products, including foodstuffs, and are looking for a load for the return trip.

■ There are no laws to prevent the hauling of garbage in refrigerated trucks or other rigs that haul food products. Several health experts warned that, even with steam-cleaning of the trailers, this practice might spread disease and should be stopped, at least until sanitary tests can be carried out.

■ Consultants have become such a big part of the world of garbage that, when western Suffolk's Multi-Town Solid Waste Management Authority closed down in 1983 without building an incinerator, its books revealed that it had spent \$8 million for little more than advice and public relations.



Rush to Burn

(Solving America's Garbage Crisis?)
Newsday staff, 1989; 269 pp.

\$14.95 (\$17.95 postpaid) from Island Press, Box 7, Covelo, CA 95428; 800/828-1302 (or Whole Earth Access)

These are only the most recent demonstrations of a fact of municipal life: Private enterprise and public works make a profitable combination — especially when politics plays a role. A *Newsday* computer tabulation found that most of the major commercial contributors to the Nassau County Republican Party over the last few years have been resource recovery contractors, ranging from engineers to electricians.

Because incineration has become their business, resource recovery engineers tend to inform and advise their clients in ways that promote the industry.

Food From Dryland Gardens

In the beginning, everyone wanted growth. Then they learned about cancer and Sprawlsville, USA. So foreign-assistance salesmen replaced "growth" with the more contemporary term "development." But somehow development never seemed to help the people who were supposed to be "developed." Then conservation came along, and consultants caught on that maybe what they were calling "development" was actually devastating the environment and sucking up the natural resources that supplied locals with a living.

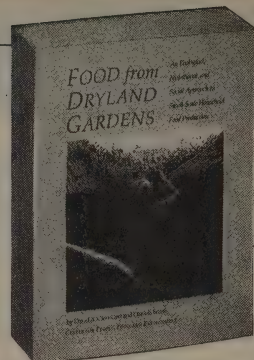
Now there is a struggle to combine conservation and development. People don't need to grow taller or fatter or reproduce ourselves like photocopiers; we need to develop a gentler, more sustainable economy. David Cleveland and Daniela Soleri are among the best of the nouveau eco-developers. Their book gives the Big Picture so that readers are always aware how small acts fit or don't fit into the larger picture. Their book is practical —

a breath of fresh earth compared to the jargon-filled tracts on how to be successful in the foreign-assistance profession. From vitamins to vegetative propagation, from marketing to salt burn, this is the first major book on dryland gardens. (To UNICEF's credit, it supported the production.) **Food From Dryland Gardens** sets the example for all people-focused garden and agroforestry books in the future.

—Peter Warshall

• Safe Homemade Pesticides

NEEM SEED EXTRACT Use: Spray to repel insects or slow their feeding; kills pests when they eat it. Recipe: Seeds of fruits fallen from the tree are cleaned, dried, and stored in a dry, ventilated place. When needed, seed hulls are removed, and seeds are finely ground and hung in a cloth sack in a container of water, using between 25-50 gm seed/liter of water (3-7 oz seed/gal of water). The ground seeds are soaked overnight in the water before using. This mixture should be made fresh



Food From Dryland Gardens

David A. Cleveland and Daniela Soleri, 1991; 387 pp.

\$25 (\$27.50 postpaid) from Center for People, Food & Environment, 344 S. 3rd Avenue, Tucson, AZ 85701

for each use as it can lose its effectiveness over time and with exposure to sunlight. Reported to control: caterpillars, beetles, grasshoppers, and other garden pests.

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Killer color photos of twenty killer insects, and one spider. All of them, from the ladybug to the tachinid fly, feed on common insect pests found in your garden. Realizing these beneficial insects are around may make you think twice before spraying. Knowing exactly what they look like can help convince the neighbors as well. Buy one for your school.

—Richard Nilsen

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(Poster)

\$5 (\$6.25 postpaid) from ANR Publications, 6701 San Pablo Avenue, Oakland, CA 94608; 510/642-2431

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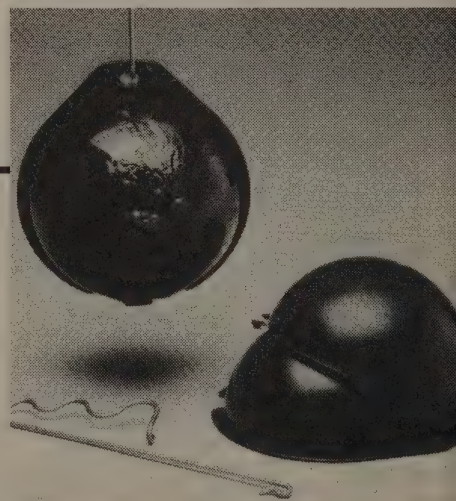
—Richard Nilsen

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• Maggot Fly Control

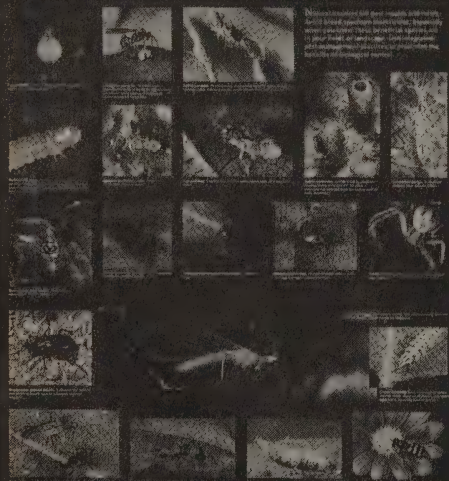
Say goodbye to wormy apples, cherries, blueberries. Our PMSI RED SPHERE TRAPS coated with TANGLE-TRAP are the "stand-ard against which to judge the effectiveness of any trap" Roger Swain, Horticulture Magazine. We've made over 200,000 since 1980. Every year we hear from cus-



tomers who have never had an edible fruit until using them! Incredibly effective and consistent control of apple maggot fly, cherry fruit fly, blueberry maggot fly, APPLE VOLATILE LURE increases effectiveness for apple maggot fly only, do not use for cherry fruit fly or blueberry maggot fly.

Home orchardists use 1 trap per dwarf-tree, 2-4 per medium, and 6-8 per full-size tree for control. Commercial growers use 1 trap with LURE per 2-3 acres for monitoring. Trap captures will help indicate need to treat with insecticide.

NATURAL ENEMIES ARE YOUR ALLIES!



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For more information, write: 918 Education and Publications, University of California, Davis, CA 95616

Common-Sense Pest Control

It doesn't have those red ribbon-markers sewn into the spine, but this book is destined to become the *Joy of Cooking* of the pest-control world. There used to be two choices when it came to pests: chemical companies offering hysteria-driven fantasies of total control, with concoctions scary enough to make your hair fall out just from reading the labels; and arrayed against these giants, a vast thicket of (usually) nontoxic folk remedies — what this book refers to as "magic."

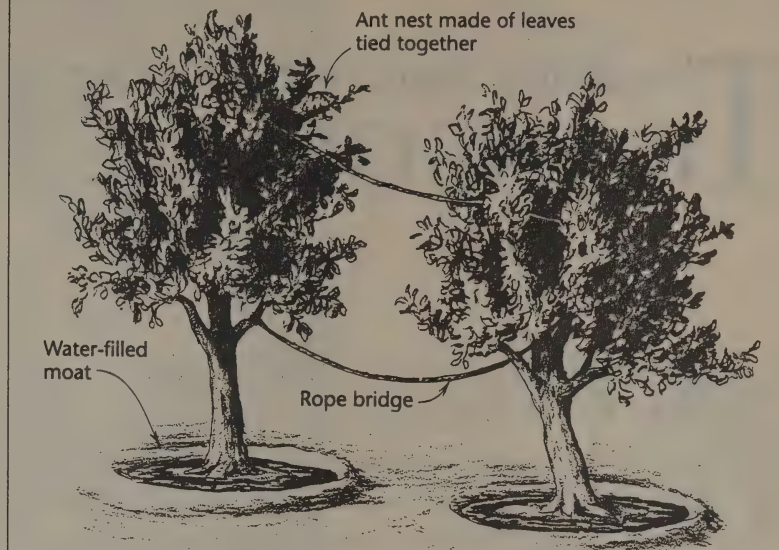
Since 1978, the authors and their non-profit Bio-Integral Resource Center have been diligently popularizing a middle way called Integrated Pest Management (IPM). We have reviewed their excellent publications, *Common-Sense Pest Control Quarterly* and *The IPM Practitioner*, numerous times. Taunton Press (*Fine Gardening*, *Fine Woodworking*, etc.) took on the huge task of getting all this wisdom neatly and graphically presented in one volume, the biggest book they have ever published. Thankfully it is well indexed and navigation is a whiz.

In the jargon of these times, this is a lifestyle book about bugs. Instead of reactions based on fear, here is biological fact, calmly presented. This insect can't stand a freeze, that vermin dies quickly if it can't find a new human host. Once understood, the natural limitations all these critters face can be exploited by manipulating their environments. That's a big part of IPM, and so is figuring out when and if more control is needed. When it is, IPM offers an escalating menu of chemical responses, with the riskiest ones saved for last. Usually they are not needed at all: many safer alternatives are now available, and they are carefully described.

To say that this is an essential book for anyone growing plants is true, but limiting. This is also the book you'll want to consult when you tire of swatting mosquitoes, when your kid brings head lice home from school, when you notice a little

The Oldest Known Biological Control Program

The oldest example of the deliberate manipulation of a natural enemy species comes from ancient China. It involves collecting nests of yellow ants (*Oecophylla smaragdina*) and placing them on citrus trees to control caterpillars and other pests. Rope bridges allow the ants to commute from tree to tree. Moat barriers on the ground force these predatory ants to stay in the trees.



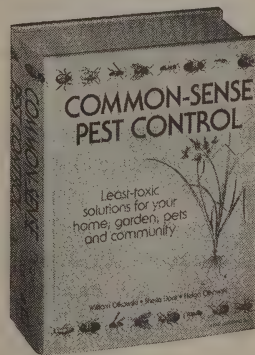
pile of sawdust by the wall in the den (termites, or wood-boring beetles?), or when your cat has fleas. Since *Earth Day 1990*, publishers have been releasing a slew of books about safe pest control. This one chews circles around the competition.

—Richard Nilsen

• The tropical neem tree (*Azadirachta indica*) is widely distributed in Africa and Asia and is grown as a beautiful ornamental shade tree in the southern United States and other subtropical regions of the continent. Neem oil extracts have been used as medicinal preparations and pest control products in Asia and Africa for centuries. Recently, neem's insecticidal, fungicidal and bactericidal properties and its safety to mammals have aroused interest among researchers in Europe and the United States. A commercial insecticide called Margosan-O® has now reached the American market. . . .

The complex structure of neem oil makes it difficult to pinpoint its mode of action. The principal active ingredient is azadirachtin, but more than 25 other active compounds, including deacetylazadirachtin, meliantriol, vepol and salannin, have also been isolated. Its various ingredients act as repellents, feeding inhibitors, egg-laying deterrents, growth retardants, sterilants and direct toxins. These multiple modes of action make it unlikely that insects or pathogens will develop resistance to neem compounds because they affect the pests in so many ways.

Drywood termites can be killed with a "gun" that shoots an electric current along termite galleries. Because it is used to spot-treat termite-infested wood, the gun serves as an alternative to fumigation of the entire structure with toxic chemicals.



Common-Sense Pest Control

William Olkowski, Sheila Daar, Helga Olkowski, 1991; 715 pp.

\$39.95 (\$42.45 postpaid) from Taunton Press, 63 S. Main Street/Box 5506, Newtown, CT 06470; 800/888-8286 (or Whole Earth Access)

• EARWIGS

(Order *Dermaptera*, family *Forficulidae*)

Despite the fact that earwigs are now known to be largely beneficial, most of us are still trying to control them in our vegetable and flower gardens and occasionally in our homes. This is partly because of the damage they cause when they eat small holes in the leaf margins of seedlings of plants such as radishes. But the desire to kill earwigs is also due to the fact that people simply don't like the way they look, whether encountered in the garden or indoors.

The appearance of their posterior pincers seems frightening. These pincers, or forceps, are used by females to defend their families against predators. Earwig mothers are very protective of their eggs and young.





Coming Soon to a Store Near You: TRANSGENIC PLANTS

BY SIMSON GARFINKEL



MOST FRESH TOMATOES bought in the U.S. today are picked green, packed in crates, and ripen on their way to market. That's because all tomatoes contain polygalacturonase (PG), a natural protein that's the biological equivalent of a self-destruct device. Before tomatoes are ripe enough to make into a hearty sauce, PG is hard at work, literally digesting the tomato from the inside. In the wild, this helps the tomato get its seeds into the ground quickly. But for farmers and grocers, PG is a headache, responsible for countless tomatoes that aren't fit to sell.

The patented "Flavr Savr" tomato is different: it looks like a regular tomato, but it doesn't rot. It's been genetically modified. The DNA for the gene that tells the plant how to make PG has been snipped out, reversed and reinserted with biotechnology's finest scalpel.

Since this new tomato rots very slowly, farmers can leave it to ripen fully on the vine, resulting in a tomato that looks, smells, and tastes better than the majority of today's storebought ones. That spells more profits for grocers, farmers, and Calgene.

Based in Davis, California, Calgene — developer of this brave new tomato — is an eleven-year-old biotech startup company with 300 employees and \$35 million in annual sales. The company filed for FDA approval in August 1991; if things go as planned, Calgene's tomato could be on supermarket shelves by 1993.

It is becoming increasingly apparent that the way most Americans will first experience the advancing biotechnology revolution won't be by undergoing a genetic test or by being cured of a disease; it will be by eating food, wearing cotton, or sniffing flowers that have been genetically engi-

neered. Calgene is not the only company pursuing the green gene: according to a recent survey, at least twenty-five U.S. companies are applying recombinant DNA techniques to plant technology. And the products under development sound like an organic farmer's wish list: carrots that taste sweeter; cotton that insects don't eat; vegetables and grains that are immune to viruses — and much more. In the future, engineered plants might be more resistant to drought, impervious to soil salinity, able to fix their own nitrogen from the air, or even have improved photosynthesis capabilities.

Both the scientific community and environmentalists are less scared about the potential dangers of recombinant DNA than they were in the early 1980s. Few believe that, like some 1950s B-grade horror movie, a lone company's genetics experiment will go crazy and become a "superpest," wreaking havoc on an unsuspecting ecosystem. "Some of the forecasts of disasters for biotech organisms were wholly unrealistic," says Dr. Rebecca Goldberg, a scientist with the Environmental Defense Fund. But there are still a few dark corners in the genetically engineered field of the not-too-distant future — dangers

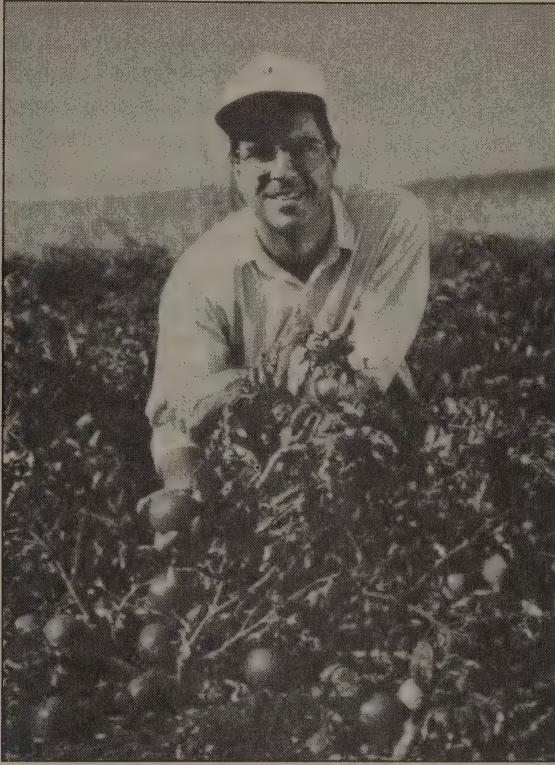
Agribusiness has been breeding tomatoes tough enough to be kicked along the highway to market. Customers complain they don't taste like they used to. Now a biotech company is splicing tomato genes in the hope of improving flavor. Is it food (the Food and Drug Administration is currently pondering this question), and will you buy it?

Simson Garfinkel writes on science and technology issues. He took issue with Eric Drexler's theories about nanotechnology in WER #67 (p. 104).

—Richard Nilsen



Calgene's Matt Kramer in a 1990 field trial of the "Flavr Savr" tomato.



not of something going wrong, but of things going exactly as planned.

One of the most disturbing developments with genetically engineered plants, says Goldberg, is that while most of the companies in the industry spend their time talking about insect and virus resistance, their research dollars go toward developing plants that are resistant to herbicides.

Monsanto, for instance, is in its fourth year of developing a variety of canola (a source of vegetable oil) that is resistant to the company's Round-Up herbicide. Round-Up is an amazingly potent herbicide: by interfering with photosynthesis, it kills everything green. Farmers planting Monsanto's new canola will be able to control weeds by spraying with Round-Up, killing everything but their cash crop.

Round-Up is an ideal herbicide, according to Jim Altemus, a Monsanto spokesman: it isn't very toxic to people and, since it breaks down in contact with soil, it doesn't collect in groundwater. And because Round-Up is so powerful, says Altemus, farmers will have to use it less: "Our whole premise in developing plants that are tolerant to herbicides is that fewer chemicals are going to be in the environment to deal with weeds. Many times the problems will be minor and not require any chemical remediation."

Goldburg and other environmentalists aren't biting. For starters, they say, companies are developing

The way most Americans will first experience the advancing biotechnology revolution won't be by undergoing a genetic test or by being cured of a disease; it will be by eating food, wearing cotton, or sniffing flowers.

crops that are resistant to pesticides that are much more dangerous than Round-Up. Calgene, says Goldberg, is developing cotton that tolerates bromoxynil, while the Agriculture Research Service in Albany, New York, is now testing potatoes tolerant to 2,4-D. (Round-Up itself isn't that safe: runoff in streams and rivers has been shown to kill aquatic life.) The actual result of herbicide-tolerant plants, say environmentalists, will be strong pressures on farmers to use more herbicides, and use them more often.

Five of the seven largest pesticide manufacturers (Bayer, Ciba-Geigy, ICI, Rhone-Poulenc, and Monsanto) are also ranked among the world's twenty-five largest seed companies; all are using biotechnology to develop herbicide-resistant plants, according to a 1987 article in *Rural Advancement Fund International Communique*. The industry's goal is to profit by selling patented seeds that only work with specific, patented pesticides.

"Are chemical companies going to develop herbicide-tolerant plants so they can sell fewer chemicals?" asks Goldberg.

To make things worse, Goldberg says, your taxes are paying for some of the research though USDA research grants. In 1990, Senator Patrick Leahy, chair of the Senate Agriculture Committee, introduced a bill that would have prohibited the "USDA from funding mission-oriented research to develop herbicide-tolerant plants," says Goldberg. The bill was with-



drawn after pressure from the USDA and industry.

Companies like Monsanto do hope to sell fewer chemicals with their insect-resistant vegetables, cotton and grains. Last summer, Monsanto conducted six outdoor tests of its insect-resistant cotton in Alabama, Mississippi, Louisiana, Arizona, and at two locations in Texas. The tests compared the insect-resistant cotton with cotton protected by a weekly application of conventional insecticide; a third field at each location was left untreated as a control.

In all the trials, the genetically engineered cotton fared as well as the chemically protected plants: less than 8 percent of the cotton bolls on each plant were destroyed, according to Dr. David Fischhoff, director of Monsanto's Plant Molecular Biology division. By comparison, between 10 percent and 40 percent of the bolls on the unprotected plants were destroyed.

The gene that protected the plants is based on a gene from *Bacillus thuringiensis* (B.t.), bacteria commonly used by organic farmers as an alternative to synthetic chemical pesticides. The B.t. bacteria produce a powerful toxin that dissolves an insect's gut on contact. Farmers using it today spray the bacteria directly on their crops. Over the past decade, Fischhoff's group has isolated one of the B.t. genes, which is responsible for producing the toxin. The company's scientists have modified the gene so that the plant will produce the toxin in significant amounts. Finally, the gene has been successfully inserted into both cotton and tomatoes. The plants now produce the B.t. toxin in every root, leaf, stem and fruit.

As the field tests indicate, the results are spectacular: "The insects stop feeding almost immediately: they don't have to feed much to get a dose that will deter them and kill them," said Fischhoff. "After half a decade of lab work . . . we might have something that can move on to be a potential plant product," he added proudly.

Other scientists familiar with the insect-resistant plants are not quite as excited. "As soon as you put a B.t. gene into a plant, you are selecting for an insect population that is resistant to B.t.," says James Liebman, a plant pathologist at the University of California at Berkeley.

After all, the same thing has happened with virtually every synthetic pesticide, starting with DDT — if a

"As soon as you put a *Bacillus thuringiensis* gene into a plant, you are selecting for an insect population that is resistant to B.t."

farmer applies a pesticide repeatedly, the local insect species develop resistance to that insecticide. In the case of these Monsanto crops, the plants will be applying the pesticide for the farmer.

"B.t. has been one of the safest pesticides around, and for a long time," says Dr. Liebman. "It has low mammalian toxicity; people think it's great. If you put a B.t. gene in the plant, and that plant expresses the B.t. gene all the time, in all parts of the plant, then you have constant selection for resistance, and you can bet that you are going to get resistant insects probably in two or three years. That would be a real shame; it would ruin B.t."

Indeed, said Fischhoff at the conference, B.t.-resistant insects have already been discovered. Monsanto plans eventually to deal with the resistance problem by

using several different toxins, or by having the toxin produced only in certain parts of the plant, or only during certain times during the growing season. But all of those approaches require more work — and in some cases, new scientific discovery — before they can be commercialized. In the meantime, companies like Monsanto will probably bring the products they have to market.

Another promise of the new biotechnology is developing plants that are resistant to viruses. This is big news for farmers, who today have few defenses against most viral plant diseases.

Viruses are the simplest form of life — so simple that some biologists say they are not alive at all. A virus consists of two parts: an inner core made up of genetic material (either DNA or RNA), and an outer shell, called a "coat," made of protein. A virus infects a cell by attaching its coat to the cell's membrane, then injecting its genetic material into its victim. The virus then takes over the infected cell, forcing it to make more copies of the virus. Eventually the infected cell makes so many copies of the new virus that the cell bursts, and the newly created viruses go on to infect more cells.

To make a plant resistant to a particular virus, scientists isolate the DNA inside the virus that makes the virus's coat and splice it into the plant's genetic code. For reasons that aren't completely understood, if the plant is already producing the protein for a virus's coat, that virus can't infect the plant.

Work is proceeding quickly. Tomatoes have been



engineered for resistance to tomato viruses X and Y; potatoes have been produced that won't succumb to the potato leaf-roll virus. Plants resistant to cucumber mosaic virus, tomato aspermy virus, and alfalfa mosaic virus have been developed.

Although at first there would seem nothing wrong with engineering plants for viral resistance, a recent article published by Dr. Gus de Zoeten at Michigan State University's Department of Botany and Plant Pathology has alarmed several ecologists. In the article, published in the journal *Phytopathology*, Zoeten hypothesizes that a plant rendered genetically immune to one kind of virus could be infected by another kind: inside the plant, the genes for the two viruses could mix, forming a new, hybrid virus.

But the biggest danger of transgenic plants hasn't even been thought of yet, says Steven Witt, president of the San Francisco-based Center for Scientific Information and the author of three books on biotechnology (*WER* #51, p. 37). "If you look at any new technology, the risks that will probably come back to haunt us [are ones] nobody knows right now." Trying to understand the new world of biotechnology through eyes trained to look at chemical pesticides doesn't work. The world of genetically engineered plants has its own benefits, and dangers, that remain to be discovered.

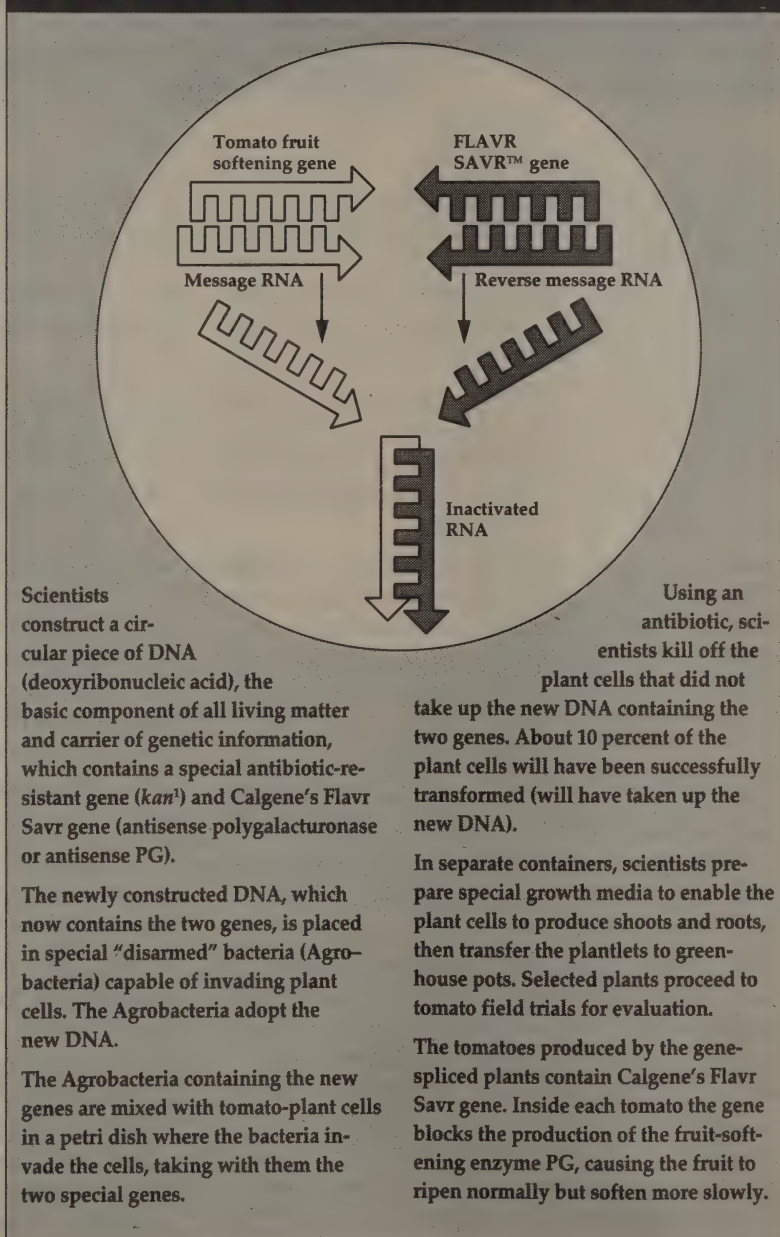
Despite these concerns, a number of genetically engineered plants are out of the laboratory and involved in field trials. Expect them to start reaching consumers before 1995.

The new engineered varieties might create new markets. DNA Plant Technology Corp., in Cinnaminon, New Jersey, has produced genetically transformed chrysanthemums with pure white blossoms, according to a recent article in *Science* magazine. More than likely, the new chrysanthemums won't replace their colored

cousins, but will be placed alongside them.

On the other hand, genetically engineered plants that are sweeter, juicier, and blemish-free might create a market climate that makes many of today's vegetables unsalable. That's a recipe for monopolies, because farmers will be only able to get each of these genetically enhanced crops from a single source. And they'll have to go back to that source every year to buy new seed: every biotech company spoken with for this article plans to sell only hybrid seed to its customers.

CALGENE'S TOMATO ALTERATION PROCESS





Twenty-five days after harvest, the tomatoes on the left are rotting. The genetically altered "Flavr Savr" tomatoes on the right are not.

"Without hybrid crops, can we make money on it?" Monsanto's Fischhoff asks rhetorically. Fischhoff says that it's unreasonable to think that biotech companies will want to gouge their customers: "Certainly, the goal in selling a product like this will be to price it so that there is a net positive return to the farmer."

From the public's point of view, possibly one of the most crucial problems still to be answered is the issue of labeling: should the government require that foods containing genetically manipulated ingredients be specially labeled?

"There is no reason to label it as 'transgenic,'" says Dr. Pamela Bridgen, executive director of the Association of Biotechnology Companies in Washington, DC. "Transgenic plants are around all over the place, from all the breeding that has been going on for the last 100 years."

Indeed, virtually all of the food for sale in the supermarket has been genetically altered: meat, vegetables — even the yogurt cultures. For as long as humans have farmed, agriculture has effected a steady pressure on the genetic makeup of plants and animals to mirror people's needs and desires.

"I can't imagine any reason why there should be a special labeling requirement for transgenic plants," says Dr. Kenneth Barton, vice president for research and development of Agregetus, Inc., in Wisconsin. "I certainly think that there should be a labeling requirement for any plants that have particular hazards of some sort, [but] if it has gotten on the market, presumably they are generally recognized as safe. I just can't understand a rationale for singling out this type of breeding."

Privately, industry sources say the real reason that they are opposed to labeling is the potential for consumer fear: consumers might be scared enough by the idea of genetically engineered foods that they refuse to purchase them, no matter how well the stuff has been tested.

"I'm not taken in by the industry's argument that we shouldn't label because the public won't buy this," says the EDF's Dr. Goldburg. "They've been hyping this technology as the greatest thing for the public. If it's so great, the public should want to buy it. If not, then they're trying to pull the wool over the eyes of unsuspecting consumers."

For thousands of years, humanity has been tinkering with plant genetic material, trying to make crops that were better than those of the previous generation. Recombinant DNA technology is the most powerful technology that's come along for forcing plant genes to do our bidding: it's a tool that lets us direct the course of evolution, while making it happen on a much more rapid timescale.

Calgene's Chairman Roger Salquist has tasted the "Flavr Savr" tomato. "Am I afraid to eat them?" says Salquist. "The answer is no."

The danger is that our knowledge of plant microbiology tends to mask our ignorance of the ways that plants interact with their surrounding environment. A plant that is safe to eat might still be responsible for unanticipated ecological or economic damage elsewhere. The fruits of this new technology — intended and otherwise — may crop up in many places beyond the neighborhood supermarket. 🍅

Northern Lights

This is a graphically sophisticated news-print magazine celebrating the life, art, and places of the Northern Rockies. It handsomely occupies a niche between the political/environmental news from this region found in **High Country News** (EWEC p. 57) and those slick, puffball regional magazines that hype lifestyle and real estate. The mix here is essays, art, and fiction, and though published by a nonprofit institute dedicated to reducing regional conflicts and uniting "the political right and left behind commonly held public values," it is not afraid to tackle controversy. **Northern Lights** elegantly gives lie to the notion that in America, culture is a bicoastal phenomenon.

—Richard Nilsen

[Suggested by Sean Gillihan]

The permit system allows the federal agency in charge to hold numbers of floaters to a maximum of about 10,000 a year, set in 1979, when use increased 250 percent in just three seasons. Each year since, the actual number of people down the river has hovered close to this ceiling, which the agency believes is the river's carrying capacity for a "quality wilderness experience." Socially, if not physically, however, "wilderness experience" seems to have

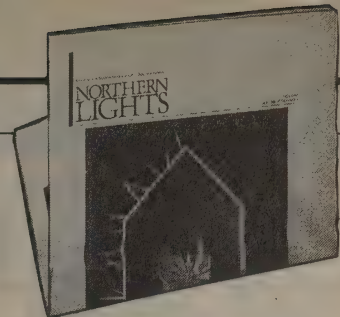
become an illusion if not irrelevant. Right now I'm the volunteer ranger managing both the illusion and the irrelevance.

Most people accept the permit system as a panacea to the explosion in numbers of river runners and the consequences for a fragile riparian corridor. Others find regulation about as painless as an IRS audit. They see the Southwest as a region of federally-neutered rivers where a person is no longer free to kill himself in a four-foot rubber duckie pulling an inner tube piled with beans, testosterone and a small machete. Instead, some geek rangerette at the put-in asks to see his bilge pump.

The Big Green Book

Planet Earth is currently appearing as a cartoon character in TV commercials for our local utility. The message is energy conservation, and Earth is human-size, sweet-tempered, and good with the one-liner. Such anthropomorphizing of Earth is increasing, along with our awareness of the limits of humankind upon it.

Here is a large children's book with an illustration of Earth, a thermometer stuck in its mouth and running a temperature. It's on the same page where James Lovelock's foreword describes Gaia as "my theory which seeks to explain why the Earth is nearly always comfortable for all its inhabitants." If you are going to be anthropomorphic, these are pretty good credentials. It's hard to think of a better use than to make complex ideas like the meteor extinction of dinosaurs, global warming, and acid rain compre-



Northern Lights

Donald Snow, Editor.

Membership in Northern Lights Research and Education Institute

\$25/year (includes 4 issues) from Northern Lights, P. O. Box 8084, Missoula, MT 59807

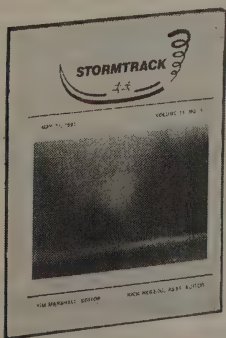
hensible to children. The environmental facts are simplified without distortion, and kids roughly eight to twelve can read it themselves. —Richard Nilsen

Stormtrack

This is a good example of something that's becoming only slightly less rare in America: a little mag devoted to the personal experience of nature — in this case, storms. Big storms. Mean storms.

Stormtrack is a bimonthly "storm zine" for folks who chase severe weather, especially tornados, for the fun and the challenge. Not that they intend to actually catch these storms, just to get close enough to watch and photograph and shiver a little.

Stormchasers have made significant contributions to severe-weather meteorology,



Stormtrack

Tim Marshall, Editor.

\$10/year (6 issues). Make checks payable to Tim Marshall, 1336 Brazos Boulevard, Lewisville, TX 75067

The Big Green Book

Fred Pearce; illustrated by Ian Winton. 1991; 29 pp.

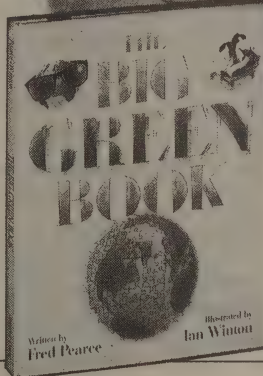
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principally by confirming in the field storm structures predicted by simulation and modeling. This is grassroots science: observational, personal, the kind anybody can do.

I think we're touching some childhood fears here, in an enthusiastic adult sort of way. **Stormtrack** is like having the Postal Service deliver an hour of gusty winds and negative ions to your mailbox.

—Michael Paul Slater

There was no reason for the tragic loss of life at Andover [Kansas]. The tornado was on the ground 20 to 30 minutes prior to hitting the town and the news media, ham radio operators, and National Weather Service were constantly airing live broadcasts of the tornado warning. I felt help-



The hole in the ozone layer is like a crack in Earth's sunglasses, letting through harmful ultraviolet radiation.

less watching the drama unfold right in front of me. I overheard the Andover police on the scanner saying they could see the tornado southwest of town heading right for them. They were going through neighborhoods with their sirens going to alert the public. Some of the most dramatic video I've seen, was a view through an Andover police car as it raced through that doomed mobile home park with sirens wailing. When the officer turned the car southwest, you could see a large black wedge approaching. Some people in the mobile home park were obviously alarmed and ran to their cars to speed away. Other persons were oblivious to what was going on and were just out for a leisure walk with their dogs. Their attitude appeared as if they saw police cars with sirens going everyday. Where's the fire?



Greenhouse & Icehouse

Might
Catastrophic
Cooling
Be Triggered By
Greenhouse
Warming?



RECURRENT NIGHTMARE for some scientists is to imagine Europe suddenly deprived of its customary wintertime bonus of tropical heat, traditionally delivered courtesy of the North Atlantic Current. As it happens, that shutoff scenario doesn't require a catastrophe-prone imagination: it has already happened many times in the past.¹ What's new is the fear that global warming might paradoxically trigger yet another abrupt episode of continental cooling.

BY
WILLIAM H.
CALVIN

If you are flying from Paris to Seattle or London to Los Angeles, you look down on the North Atlantic Current sweeping up from the warm tropics to the vicinity of Iceland (well, at least you see the clouds that it encourages, drifting toward Europe). This current (Fig. 1), with only a minor contribution from the Gulf Stream, is what keeps Europe wet and warm. After all, judging from its northerly latitudes and the associated sunshine, Europe really ought to be like Canada. Or perhaps like Siberia. While Canada is a nice place, its agriculture supports only about 4 percent as many people as Europe's climate sustains (France alone has twice Canada's population). Such is the difference made by the North Atlantic Current.

The day before my most recent transatlantic overview, while browsing the library at La Cité des Sciences et de l'Industrie, I came upon the article² by Mikolajewicz et al. in the 14 June 1990 issue of *Nature*. And it ruined my last night in Paris. Even though the authors do not discuss abrupt climate shifts of the past or their mechanisms, the results of their simulations of ocean circulation are disturbing to anyone who has been following the news about ice-age climates. The predicted changes in the North Atlantic Ocean in the next few decades of greenhouse warming of the atmosphere are like those that oth-

ers^{3,4} have suggested were responsible for the last major episode of cold and arid climate in Europe (eastern North America was affected to a lesser extent). The idea that global warming can trigger abrupt cooling is far more alarming than the now-familiar predictions of slowly rising sea level and slowly thinning ozone.

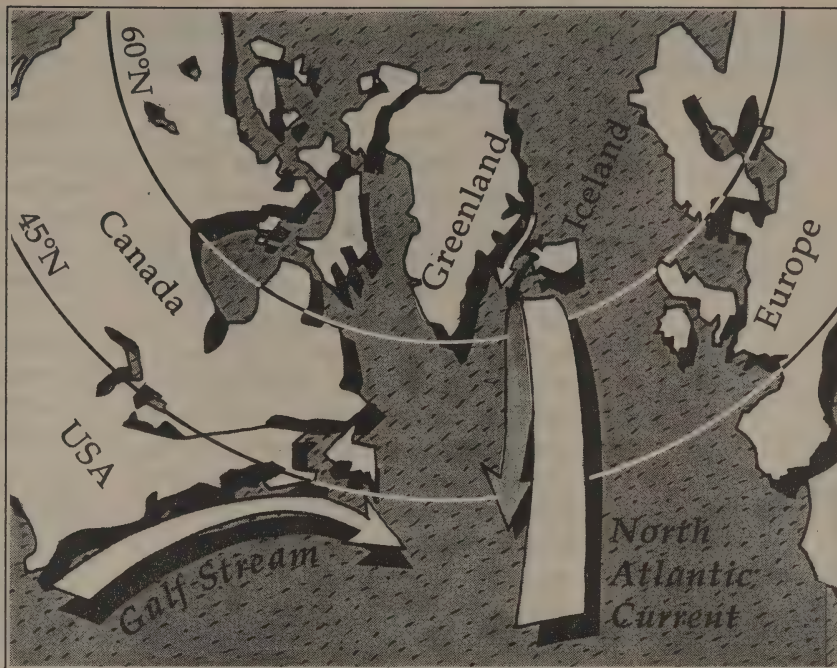
Minor fluctuations in North Atlantic climate a thousand years ago were responsible for why Iceland was not named Greenland and vice versa (by the time that the coast of Greenland was settled by explorers from Iceland, things had warmed somewhat). Then came the Little Ice Age which wiped out the non-Inuit settlements on Greenland.⁵ Yet neither such changes of the last millennium, nor the occasional multiyear drought, is what is meant by *abrupt* climate change. The most recent abrupt episode was the Younger Dryas: in the midst of the rising CO₂ and the general warming trend that melted the ice sheets of the last glaciation, there was a "cold spike" that lasted about 800 years.

It caused European forests to die within a decade or two; they were replaced with Arctic-adapted plants such as *Dryas*. It caused Scotland's glaciers to form once again. Because this happened when northern-hemisphere summer sunshine was near its astro-

William Calvin normally writes about brains and evolution, his main research interests. "But Stewart Brand told me that every scientist should do a little journalism now and then, and encouraged me to develop this climatology theme that I stumbled upon while writing The Ascent of Mind" (WER #70, p. 63).

—Howard Rheingold

nomical maximum, it served to alert climatologists that there was more to ice advance than just the familiar Milankovitch cycles (it has since been discovered that southern-hemisphere ice sheets also fail to follow the predictions; rather, they often advance at the same times that northern-hemisphere glaciers do). A good time for rapidly melting all that ice in the northern hemisphere is, just as Milankovitch predicted,⁶ when the earth's axial tilt is maximal *and* the earth's closest approach to the sun occurs in June — but there appears to be something else going on that can occasionally override this general pacemaker of the ice cycles.



The Younger Dryas cooling started 11,500 years ago; it lasted until 10,700 years ago, when it ended even more suddenly than it began. Thanks to the year-by-year detail in the ice cores of Greenland studied by Dansgaard et al., we know that rainfall returned over a 20-year period and, as Europe's land surface warmed up, the formerly severe winter storms diminished dramatically in that same two-decade-long period.⁷ As can be seen in the top of Figure 2, cooling episodes are just as rapid (though often with associated hot-and-cold "whiplash" chattering). Once triggered, mode-switching climatic "leaps" evidently operate on a far faster time scale than the 20,000- to 100,000-year Milankovitch cycles, faster even than the century-long time scale of the predicted greenhouse warming. What triggers such an abrupt change in climate?

DISTURBING THE WATERFALL

What the sleep-depriving ocean-current simulations² implied is that, in response to greenhouse warming, northern Atlantic surface salinity will decrease, deep water production will drastically decrease in the ocean just south of Iceland, and surface temperatures will drop. Unless you know about ice age climates and salt economies, that combination might not seem noteworthy. Those three factors are, alas, the conditions earlier

proposed by Broecker and coworkers³ as having encouraged the onset of the Younger Dryas. Their theory is akin to traditional ones for how extra rainfall reverses the salt circulation in estuaries (and in the Mediterranean during the last Pluvial), just scaled up to an entire ocean. One says "encourage" rather than "cause" because cause-and-effect reasoning can be tricky, given that nonlinear systems often chase their tails.

That is a particularly apt description of the wintertime North Atlantic Current (Fig. 1): it even does a vertical U-turn. Northbound, it rises to the surface near Iceland and releases a bonus of heat to the Europe-bound winds from Canada; this contribution is equal to 30 percent of what sunshine provides to the northern Atlantic.⁴ Then the current — now so cold and hypersaline that it is denser than any layer of underlying water — plunges from the surface to the abyss. Once the dense water has sunk under its own weight to the sea floor, it flows south — and so attracts even more warm currents north to replace it. It is unfortunate that there isn't a giant northern Atlantic whirlpool or waterfall for television crews to focus upon, as commentators somberly warn of its key role in Europe's viability. This deep water production is equal in magnitude to 20 times the combined flow of all the rivers of the world⁴ — and three-quarters of it

Figure 1. The North Atlantic Current carries tropical water northward, bestowing warmth (and concomitant rainfall) on Europe. Having dispersed its heat and increased in salinity through evaporation, the current doubles under itself and flows back toward the tropics to repeat the cycle.

A deluge of freshwater (as from a massive glacial melt or, less dramatically, from increased rainfall) could disrupt the loop, redirect it, or stop it altogether.



might disappear in only 35 years, according to those new greenhouse simulations.²

In the Boolean logic demonstration at La Cité, hydraulic currents of colored water in glass columns switch themselves on and off. So can the North Atlantic Current: despite its enormous momentum, this salty stream stops flowing, ceasing to transport tropical heat north for airborne transfer east to Europe. It did that during the last major glaciation, and again during the Younger Dryas;⁸ one supposes that another such shutdown will be associated with the beginning of the next ice age (and our present interglacial period has already lasted as long as the previous one, between 128,000 and 118,000 years ago). What might derail the conveyor?

The obvious way to break the loop of warm-water-chasing-hypersaline-water, and thus turn off the virtual waterfall, is to flood the surface of the northern Atlantic with a deluge of fresh water. Say, from a lake of glacial meltwater impounded behind a dam that breaks. Or, more gradually, just from changes in rainfall patterns, presumably a major factor in the freshening seen in those greenhouse simulations (which didn't take such nonlinear ice dynamics into account). Shutdown can also be achieved by smothering: floating ice blanketing the northern Atlantic might prevent the wind-driven evaporation that makes the surface waters so hypersaline and heavy every winter. Once interrupted by one means or another, the loop that warms Europe might take some time to get started again, awaiting climate fluctuations that carry ocean currents into initial conditions for a diving loop. Tail-chasing loops can be harder to initiate than to maintain.

FLOODS AND FIREHOSES

Broecker et al.⁹ have recently examined whether the Younger Dryas was associated with the partial drainage of Lake Agassiz, a giant midcontinental lake of meltwater, flooding the North Atlantic via the St. Lawrence River's outlet. Some of those worried about repeat performances of the Younger Dryas have likely welcomed the Lake Agassiz theory with a sense of relief, since massive amounts of meltwater are no longer available for release from the Cana-

dian coastline (or, for that matter, from the Scandinavian). But the coral-reef record of late glacial sea-level change (from which century-by-century meltwater additions can be inferred) does not indicate that there was massive flooding during the Younger Dryas.^{10,11,12} I would also note that, especially during lowered sea level, the St. Lawrence River largely emerges southwest of the Grand Banks of Newfoundland, mixing with Atlantic waters at 45°N, hardly a major site of deep water production. One would expect the northern Atlantic to be more sensitive to freshwater flooding.

Above 60°N, the vertical U-turn is presumably shaped by the sea floor rising 3,000 meters from the abyss to the shallow continental shelf south and west of Iceland; fresh flows from Greenland's fjords might shut down a particularly active region of the waterfall. The enormous fjord system on Greenland's east coast can presumably produce strong freshwater flows channeled south between Iceland and Greenland (Fig. 1). This "concentrated" freshwater flow out of Denmark Strait might act something like a firehose, quenching the salty waterfall in a sensitive spot.

Whether by such focal freshwater or the more diffuse dilutions (which also act by causing winter pack ice to extend further south, capping evaporation), repeat performances of the Younger Dryas shutdown might still be possible, as there are massive amounts of meltwater available from a greenhouse Greenland. The last time I flew from Seattle to Copenhagen, the iceberg factory in Greenland's long east coast fjords at 70°N looked quite active. There were a number of meltwater lakes somewhat inland, on the shoulders of the ice sheet. Often such a lake drains because a crevasse opens up beneath it, but the sudden deluge into the depths may serve to lubricate the ice's attachment to underlying rock. This may, in turn, promote a glacial surge into the tidal waters, thereby amplifying the melting.

Furthermore, each fjord (and Greenland has more than its share) is capable of temporarily housing a meltwater lake. This happens when a glacial surge comes in somewhere along one side of the narrow channel; a few

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are being
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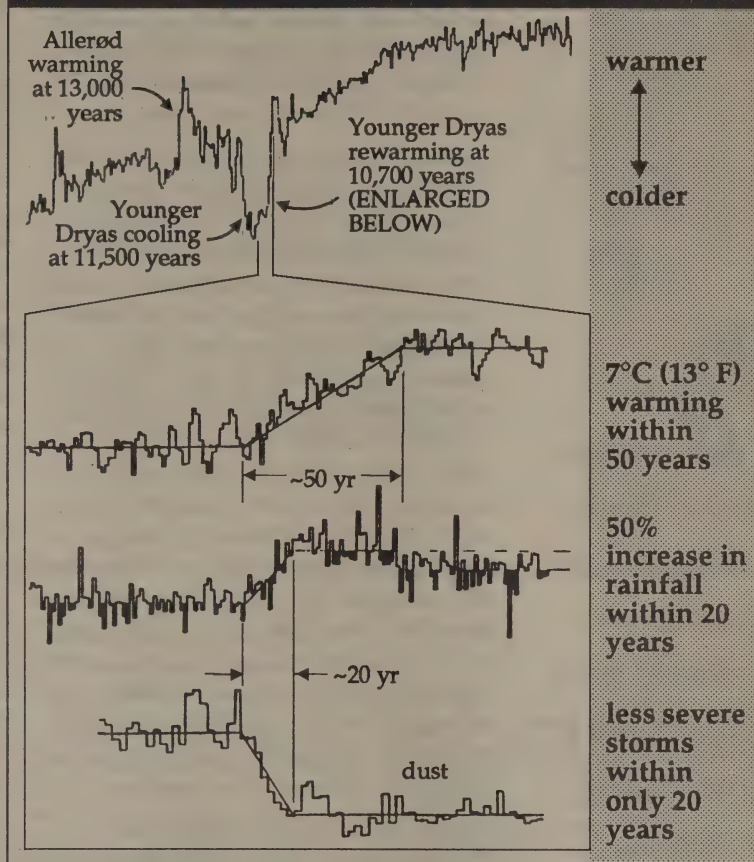
years ago, the entire southern arm of Yakutat Bay in Alaska was dammed up in this manner, trapping many marine mammals in the freshening waters. After enough backup, such ice dams eventually break, releasing months to years of meltwater within days. So one expects a lot of month-to-month variation in freshwater flows near a deglaciating Greenland, something that would be smoothed out if the meltwater had first to traverse such long overland paths as the Mississippi River or the St. Lawrence River.

THE CAREFUL HANDLING OF INSTABILITIES

Whatever the fate of any such theories for the Younger Dryas *per se*, "relief" is likely wishful thinking; it must be remembered that the Younger Dryas was only the most recent of more than a dozen abrupt climate changes in the northern Atlantic region.¹³ As Broecker¹⁴ noted, "The records of the last 150,000 years . . . scream at us that the earth's climate system is highly sensitive to nudges. . . . By adding infrared-absorbing gases to the atmosphere, we are effectively playing Russian roulette with our climate." In addition to all the nudges from fjord floods, the northern Atlantic may also have an underlying instability, a tendency to flip.¹⁵ Given such predispositions, we must not let the complexities of triggering one particular episode obscure the more general problem: understanding what attracts warm tropical waters to the northern Atlantic (which surely involves the salt circulation), what could trigger another abrupt loss of this warming (which surely includes the freshening of surface waters in the northern Atlantic), and what serves to stabilize the loop.

The dynamics of such "latch-up," and the occasional "chattering" between the resulting modes when conditions are marginal, will likely be addressed by catastrophe theorists; models that utilize average melt rates, and so smooth out the major floods, may be inadequate, failing to discover shutdown and whiplash scenarios. We certainly need some assessment, and soon, of just how close we

The Abrupt Termination of the Younger Dryas



currently are to the switchover conditions. Meanwhile, those with practical experience in dealing with nonlinear systems would undoubtedly offer this cautionary rule of thumb:¹⁶ *Avoid sudden changes.* In the early days of airplane design, bumpy air (of the kind one encounters over the Atlantic) or sudden maneuvers could put an airplane into a tailspin. Sometimes the plane was shaken apart. The obvious advice to minimize unpleasant surprises: *Take it slowly*, unless you thoroughly understand the system (or, as with paper airplanes, can afford to engage in destructive testing).

Taking it slowly is not what we have been doing, given the speed with which CO₂ and greenhouse gases are increasing. Or the rapidity with which our tropical forests are being eliminated. Whether it qualifies as a nudge or a kick remains to be estimated by the theorists. We simply cannot now say exactly *when* the icehouse cometh, just that it will

Figure 2. Greenland's ice layers provide a year-by-year record of the North Atlantic climate. These records, spanning about 17,000 to 4,000 years ago, are from the analysis of Dansgaard et al (1989).



probably happen much more abruptly than Milankovitch-based thinking has envisaged. Certainly our scientific understanding of the mode-switching processes in atmosphere and ocean is far short of what we will need to stabilize the North Atlantic Current.

And from the current level of resources available to researchers, you'd think that it was Antarctica that was threatened rather than Europe and the east coast of North America: I didn't see a fleet of oceanographic research ships down there studying the North Atlantic Current year-round, nor have I heard of a half-dozen supercomputer-equipped theoretical groups modeling the dynamics of the Current, nor is there a high-powered planning group evaluating technological responses, in the event that we discover that the winter waterfall is weakening. There is no major effort in reproductive physiology to find new ways of stopping the population explosion: the increases in greenhouse gases are often secondary to more people, and it remains to be seen if current plans to clean up emissions over the coming decades will even compensate for what the worldwide population increase will add in the meantime.

The 500 million people in Europe who depend on that bonus from the North Atlantic Current (perhaps 700 million: the Younger Dryas climate changes reached at least as far east as the Ukraine) have a considerable interest in preventing such unpleasant surprises as were experienced by the hunters and gatherers living in Europe 11,500 years ago. The thousand-fold population increase since then causes Europe to be particularly vulnerable to climatic shocks that arrive with little warning; the two-decade-long excursion of the proxy climate indicators (Fig. 2) should be interpreted to mean that significant changes could occur in several years. Essentially, a drought would start, get worse — and then it would be too late for stockpiling.

REGIONAL COOLING, WORLDWIDE CHALLENGE

But non-Europeans are vulnerable too, and not just those along the eastern shores of North America (and elsewhere around the world where repercussions of the Younger Dryas have been detected). Abrupt and widespread agricultural shortfalls in densely

populated technological societies tend to suggest lebensraum-style global conflict. Affected populations will initially switch (as they have during brief droughts of the past) to themselves eating the feed grains that now produce meat at 20 percent efficiency — but remember how poorly an "economic response" worked for Ireland in the nineteenth-century famine. Another cold spike need not endure for 800 years to exhaust stockpiles and people's patience. Just imagine any country affected by the North Atlantic Current contemplating starvation — while possessing the military technology needed to take over another country (which will undoubtedly be described by the aggressors as "irresponsibly squandering its agricultural potential while others starve").

From the Younger Dryas, one sees that regional cooling can occur in the process of global warming, that the transition can be quite abrupt, and that the duration can be far longer than the usual drought, plague, or war. Preventing another shutdown of the North Atlantic Current seems the only sensible strategy, as the climate's transition is likely to be too precipitous for peaceful economic rearrangements and population relocations. Overhauling our technology that contributes to greenhouse warming is an obvious first step, and now an even more urgent one. But we shall need to specifically address the icehouse as well, with a level of basic science that will serve to quickly suggest a variety of possible technological responses.

To suppose that a climatic cooling cancels greenhouse warming, in the familiar way we fix a scalding shower by adjusting the cold-water tap, is to indulge in a fool's paradise. The *distribution* is all-important. Even if the water heater has been readjusted to produce warmer water, you can still get an inescapable blast of icy water — if the hot-water supply is abruptly diverted to the washing machine. We now see how a gradual greenhouse could paradoxically promote an abrupt icehouse. Whatever the generalities applicable to the long term, we need the science and technology to first survive the short term, to somehow maneuver around the whiplash conditions that might shake our civilization apart.



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Save The Planet

Yes, the title is grandiose, and yes, there is an irony to using a computer program to attack technology-triggered problems, but *Save the Planet* is a good example of how inexpensive software can be used for education and activism. On the Mac, it's a Hypercard stack. On both Macintosh and IBM versions, this \$20 program uses graphics and text to show the relationships between atmospheric chemistry, fossil-fuel combustion, population growth, and forest destruction. A simple simula-

tion shows how policy decisions can lead to different ecological tradeoffs. The tutorial section leads to bibliographic references and action sections — an appropriate use of hypertext. And the action sections include a simple word processor and annually updated database of US congressional representatives, indexed by state, district, hometown, and party, including a summary of last year's environmental voting record of all members of Congress. —Howard Rheingold

Save the Planet

System requirements: (IBM) 512K; (Macintosh) Hypercard & 1-megabyte RAM.

\$20 (registration and current disk, plus 2 annual updates. Overseas airmail shipping and handling **\$8** — required for all orders outside US and Canada) from Save the Planet Software, P. O. Box 45, Pitkin, CO 81241; 303/641-5035

Global Warming and Ozone Depletion



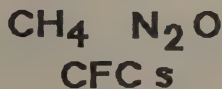
Greenhouse Gases Cause Warming



Culprit: CO₂ From Fossil Fuel Use



How Fast is the Earth Heating Up?



Other Villains: Methane, CFC s, N₂O



CFC Destruction of the Ozone Layer



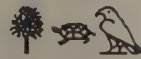
Forest Destruction Means More Heat



Warming Effects: Weather & Crops



Oceans, Icecaps & Rising Sea Levels



Extinction of Plants, Animals, Man?

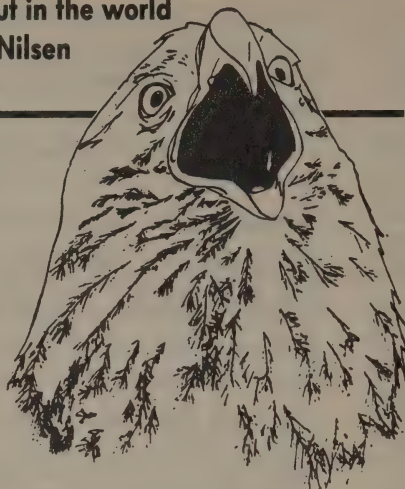


THE UPHEAVAL within the Earth First! movement is looking more like several new beginnings than the end of anything. Recent changes have shaken out in the world of print, as follows. —Richard Nilsen

Earth First!

Well, you don't just stop a juggernaut by saying "I quit" and walking away. The Earth First! movement continues, and it still has this tabloid to cover its ever-expanding diversity. The most visible new addition is the wedge that caused the split within the movement to begin with — the introduction of social-justice issues into what had been pretty exclusively an activist wilderness agenda.

With the founding fathers largely departed and these social-justice voices now clearly audible, this rag could degenerate into factional bickering — something the Left has perfected into an art form. Right now it's way too early to make that call. Trying to carve a path that includes loggers and their economy, and old-growth forests and women's issues and wilderness lovers (to give just one current



example) is clearly a much tougher nut to crack than just advocating wilderness for the plants and animals — and people keep the hell out. The new magazine is broader in focus, clearly in transition (edited most recently by a collective), but still full of news about brave people taking direct action to protect small parts of the world. It is shriller, yes, but it has one of the liveliest letters-to-the-Editor departments anywhere.

—Richard Nilsen



Earth First!

\$20/year (8 issues) from Earth First!, Box 5176, Missoula, MT 59806; 406/728-8114

Dave Foreman's Books of the Big Outside

The mail-order book business from the old *Earth First! Journal* has stayed in Tucson. To anyone either new to the field of environmental conservation or wanting to dig deeper, this is the place to go. The emphasis is on quality, not quantity. Old classics and the best of the new titles are catalogued, each with a brief review by Foreman. A person could do some very ecologically conscious shopping here.

—Richard Nilsen

Dave Foreman's Books of the Big Outside

Catalog **free** from Ned Ludd Books, P. O. Box 5141, Tucson, AZ 85703; 602/628-9610

The Earth First! Reader

This is an anthology of the best thinking to come out of Earth First! during its initial decade. These selections from the *Earth First! Journal* by its former editor are an effective refutation of the Establishment argument that these folks should be dismissed as a bunch of crazies.

Visionaries, yes; crazies, no. In between all those pictures in the *Journal* of earnest folks chained to bulldozers, or parading before the suits on a downtown street, dressed as animals, there were these ideas — which have revolutionized the American conservation movement. The pictures got left behind, but the passionate words and the scientific, tactical, and philosophical arguments have been collected here.

—Richard Nilsen

Wild Earth

Dave Foreman, who left *Earth First!* in 1990, and former *Earth First! Journal* editor John Davis have made a new home for themselves in *Wild Earth*.

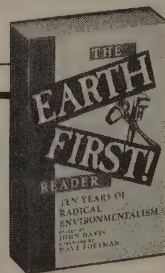
They have also managed to transplant many of the contributors who formed the brain trust of the old *Journal*, people like Dolores LaChapelle, Reed Noss, and Christopher Manes.

Having worked for a mainstream conservation group (The Wilderness Society) in the seventies and co-founded a radical alternative (*Earth First!*) in the eighties, Foreman is now championing the grass roots. In the magazine's second issue (Summer 1991), he provides a fascinating political history of the American conservation movement during the last two decades, and then announces a "New Conservation Movement" for the future. Twenty-two of the newer, often regional, grass-roots groups that serve to delineate these changes are profiled. The feel here is still tribal, or bioregional, but all the while getting better organized on a smaller scale.

Conservation biology is the discipline, preserving wilderness is the task, and ensuring biodiversity is the goal of this thoughtful new magazine. It looks to be a good place to scope out the future of our wild places.

—Richard Nilsen

As the biocentric, biodiversity ideas of the New Conservation Movement are debated, they will trickle down into the rhetoric and platforms of mainstream groups and finally down to the nether depths of government agencies and politicians. When this happens, we will be invited into the smoke-filled rooms to cut deals and join in "manage-



The Earth First! Reader

John Davis, Editor. 1991; 272 pp.

\$14.95 (\$16.95 postpaid) from Gibbs Smith, Publisher, P. O. Box 667, Layton, UT 84041; 801/544-9800 (or Whole Earth Access)

The timber industry often avoids reporting sabotage or lies about the cause of the damage so as to keep their insurance companies in the dark (their natural element). Timber industry spokesmen suggest



Goatwalking

Jim Corbett is a leader of the sanctuary movement that brought the plight of political refugees from the Central American killing fields to national attention a decade ago. This book eventually tells part of that story, but it gets there by following a very strange path — the author's life. Corbett appears to be a walking contradiction: a southern-Arizona cowboy who prefers goats and the life of a pastoral nomadic, a Quaker who is also a member of the National Rifle Association. He has written an autobiographical sermon, dense in places, lucid in others, about how to live the good life in an ethical sense.

He's a grizzly old master, and doesn't let anyone off the hook with a convenient answer, least of all himself. In this age of weaseling amorality, reading this book is like being hit with a bucket of cold water. You can look up midway and say, "Gee, if it hadn't been for our imperialist Cold War government always backing the wrong side in Central America, none of this would ever have happened." And there will be Corbett — like Mr. Natural — showing you THAT'S NOT THE POINT. By its very nature, any government limits human freedom, with individual action and ethical choice always hanging in the balance.

*Goatwalking would make a fascinating text to base an introductory government course on, because it fans out in so many directions, as Corbett gathers a lifetime's experience and shapes his actions with that wisdom. Here are dissertations about what those desert nomads were up to in the Old Testament, about what the Buddha thought, what Gandhi thought, and how that is different from what Saul Alinsky thought. Corbett also considers Hobbes, Locke and, most importantly, Don Quixote. This is a philosophical book about political tactics that is also a desert survival guide. And it is a book about goats; not since David Mackenzie's classic *Goat Husbandry* have I encountered anyone who gets inside their heads the way Corbett does.*

—Richard Nilsen

• The goat is the natural emblem of anarchy. It is the most adaptable pastoral animal, and pastoral nomadism remains the only form of livelihood that permits subjugated communities to walk away from the state. Quick-witted, social, and educable, with a capacious, high-speed digestive system, a thorn-chewing mouth, cliff-climbing hooves, and a relatively indiscriminating appetite for low-grade roughage, goats thrive on a wider range of plants and in more varied terrain than any other large herbivorous mammal. On range where other domesticated animals would starve, goats often provide both milk and meat for their human partners. Because goats will readily

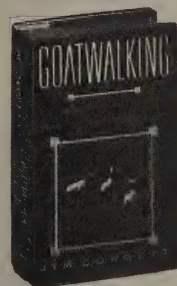
admit human beings into herd membership, they can be managed and moved without fences, corrals, hobbles, tethers, or any of the other mechanical devices used to control other livestock. From the Alps to the Empty Quarter, Java to Baja, with the goat as a partner, human beings can support themselves in most wildland environments.

• Goats' dislike for water can be used as a quick, painless way to impose discipline; the herder wets his fingers and flicks a few drops at the offender, who will then immediately back away. Goats soon learn that a flick of the hand means "back off and behave yourself" and will respond without being sprinkled. This is also an effective way to teach them what to leave alone in camp.

• Before the age of fossil fuels, pastoral nomads enjoyed the strategic advantages now associated with guerrillas. More mobile than any other human society and having no fixed bases to defend, they could choose the time and place for attack and, if necessary, retreat indefinitely without sacrifice. Militarily, all of their attention and resources could be devoted to attack, because escape substituted for defense.

• The Saguaro-Juniper Covenant . . . includes the following "bill of rights for the land":

1. The land has a right to be free of human activity that accelerates erosion.
2. Native plants and animals on the land have a right to life with a minimum of human disturbance.
3. The land has the right to evolve its own character from its own elements without scarring from construction or the importation of foreign objects dominating the scene.
4. The land has a preeminent right to the preservation of its unique or rare constituents and features.
5. The land, its waters, rocks, and minerals, its plants and animals, and their fruits and harvest have a right never to be rented, sold, extracted, or exported as mere commodities.

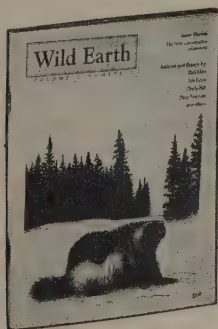


Goatwalking

Jim Corbett, 1991; 237 pp.

\$19.95 (\$21.95 postpaid) from Viking Penguin/Cash Sales, 120 Woodbine Street, Bergenfield, NJ 07621; 800/253-6476 (or Whole Earth Access)

ment." We will be sorely tempted to compromise for such political access, such credibility. We need to guard against this and recognize the fundament of conservation activism: Our job is to argue for the natural world. We speak for Wolf. It is not our task to make the ultimate political compromises but to push those who do (politicians and bureaucrats) as far as we can toward our positions.



Wild Earth

John Davis, Editor.

\$20/year (4 issues) from Wild Earth, P. O. Box 492, Canton, NY 13617

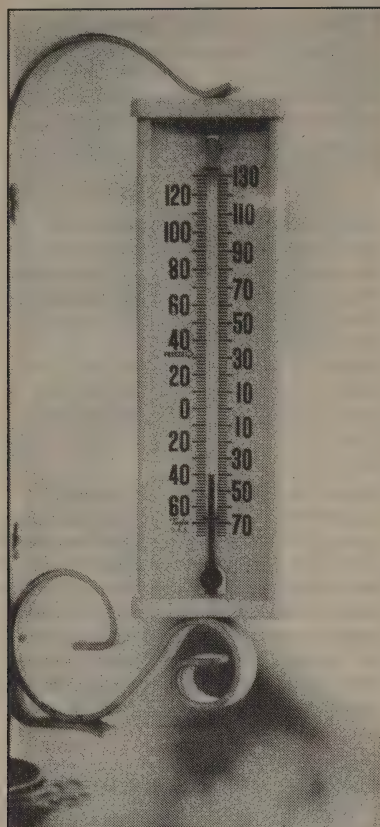
that 1 out of every 2 monkey-wrenching incidents goes unreported. According to Forest Service agents in region 5 (California), at least a dozen tree-spikings occurred in their jurisdiction last year. These tend not to get into the papers since monkey-wrenchers realized a while back that once the incident reaches the media the Forest Service will stop at nothing to go through with the sale in order to show that it is in control of the public lands.

• Sometimes monkeywrenching as an economic weapon is completely effective: When in 1985 ecotours firebombed the \$250,000 wood-chipper in Hawaii that was grinding rainforest into fuel for sugar mills (without a permit and in violation of a court order), the company went bankrupt.

THE POWER OF NEGATIVE NUMBERS

Extremes of Cold Temperature in Fairbanks, Alaska

TEXT AND PHOTOS BY DOUG YATES



Character, equipment, and relationships are put to the test when the temperature reaches this point. Alcoholism, suicide, seasonal affective disorder, and domestic violence are prevalent in both native and white communities.

Should you tire of questioning technology, or even of thinking about it, you can always move to Alaska, where the weather will do it for you. Doug Yates took the photos of Chinese ice sculptures that graced our back cover in the summer of 1988 (WER #59). His stunning photographs of frozen water are also available as postcards, from 64th Parallel Press, Box 221, Ester, AK 99725. —Richard Nilsen

W

INTER ON THE 64TH PARALLEL is the great equalizer. Geography and climate collaborate to level aspirations and limit expectations. In these parts chop wood, carry water has been de rigueur for as long as human memory. Alien to the rest of America and a testimony to endurance, Fairbanksans regale summer visitors with tales of oil that won't flow, houses heaved off their foundations by permafrost, moose in the yard, wolves in the valley, square car tires, and ice fog so thick drivers get lost a block from home. Fairbanks: the name's irony is not lost on the locals.

While precise calibrations satisfy rational understanding, local knowledge measures cold in terms of adversary and companion, in terms of dry birch and twelve-hour burns. Over the radio, from Ambler to Venetie, a recitation of the daily highs and lows joins a flurry of statistics in search of an average. Between data and authentic experience is a journey leavened with a respect that comes with knowing a place.

Sliding toward winter solstice, up to an hour of sunlight is lost each week. On December 21, the seasonal nadir, residents cope with nights twenty hours long. Light deprivation, extreme cold, social isolation and its mental implications occupy psychological researchers and crisis counselors with the darker regions of the human condition.

With a population of 60,000, Fairbanks is the state's second-largest city, and is located on the Chena River halfway between Anchorage and Prudhoe Bay. Founded in 1902

when a steamboat ran aground, the settlement has ridden between gold and oil on a cycle of boom and bust, never able to boast of a stable economy. The region's historic cold weather has provided a macabre vanity and a claim to fame.

Through private grit and government subsidy, the city has a reputation for defying sustained and extreme cold. Domestic chores and the workday routine press on despite emergencies and personal hardships. Local dog-mushing and Nordic ski racing wimp out at 20 below but schools and government never close. Taxis and emergency vehicles, unless sheltered in heated garages, idle around the clock during cold waves.

For those who must venture beyond the fireside, every gesture is measured. Complacency is broken; survival is the currency. Assumptions about a generous universe freeze in their tracks. Credit is tight. The standard greeting, "How are you?"

begins to elicit truthful responses; polite evasion requires too much energy.

I carry water in five-gallon plastic jugs. Hauling drinking water in these temperatures is risky business; 60 pounds of ice with "easi-grip" handles means I wasn't quick enough.

My water hole is a neighborhood laundry. As from a dragon's mouth, clouds of vapor vent from the busy doors. At the ice-slick doorway dramatic boundaries are never more appealing. In this direction the temperature differential runs from 70 below to 70 degrees above zero.

Water vapor condenses to ice on the glass; the doors are swinging glaciers. The passageway, its bulletin board aflutter with meeting notices now canceled, seems one of those time machines television invents to cast us into other dimensions.

It is a launching point of sorts. Here people suit up, pulling on all the wool and down they own. Arranging layers, parents help kids with clumsy buttons and wayward scarves. Velcro cries, zippers whine, and nylon whispers, but the little chorus is lost in the rush of wind and fear. Shuffling to the car or grocery everyone resembles the Michelin Tire Man minus the cheery smile and wave.

Under a harsh fluorescent glare, while the churning washers and dryers assure me of technological supremacy, washday gossip spins and embellishes winter reality in a modern version of arctic folklore. Colorful and tragic events stretch credulity but are often confirmed in the next day's newspaper:

"Running home in tennis shoes, a babysitter loses a toe to frostbite. House abandoned after water pipes freeze and break when the furnace starves on a diet of fuel oil turned to Jell-O. Hal, the electronic garage door, holds off the owners until he is pried open in a fury of crowbars and axes. The steering wheel of a school bus is so stiff with cold it takes the driver and a helper to muscle the

vehicle through tight corners. Carbon monoxide kills two while car idles in garage."

Running errands on the street I pass strangers with grey, blotchy faces. This is frostbite. White people may say to each other, with a nod to call attention, "Bit of frost there on your nose and face," and keep walking. I've seen Athabascan Indians meet, pull off beaded moosehide mittens, and press palms to another's face, all the while talking about something unrelated.

When not caught in time, cold trauma can be an exquisite torture. Victims swear and cry in desperation as sensation floods back into fingers, toes and ears exposed beyond endurance. The pain is so intense, malice must be involved. Irrational logic floods islands of resolve. How can so much pain come from such benign and familiar appendages? Later they may look like meat gone bad: fingers split like sausage casings, turning black in sepsis.

Through this open freezer my drinking water rides in the cab with me. Like big dogs happy to be up front, the jugs, one red, one white, bounce

and slosh along until the flat spots in the tires smooth out. The water gurgles a chaotic rhythm as the road pitches across frost heaves. Wet and fertile, the sound of captive water fosters a protective attitude exclusive to northern regions.

Experience confirms the wisdom of sheltering other inanimates as well. I've got my vehicle's grille blocked off to reduce the radiator's efficiency. Slowing the airflow raises engine temperatures to near-normal levels and provides a measure of heat in the cab. Dimpled tinfoil and scrounged cardboard still carrying logos for Pampers or New Zealand apples show a distinctive, self-reliant adaptation to local transportation.

Like racehorse trainers after a workout, some commuters drape the hoods of Subarus and Saabs with quilts and wool blankets. Upscale parking lots resemble bedrooms as arrivals tuck in their mechanical brides before heading into the office.

Nosing through traffic, my steering wheel is almost locked with friction. A stiff cable gives the speedometer spastic fits. Bearings in the defroster whine and complain but I manage a



On December 21, winter solstice, Fairbanks receives a slim ration of sunlight. Four hours of daylight are further complicated by dense ice fog in urban areas.

tunnel view of the unfolding roadway. Passing the time-&-temperature sign I see it's warmed a bit. Through a cheerless yellow halo it blinks -49, -49, -49.

Traffic is camouflaged in thick and swirling clouds of ice fog. As the real cold descends (temperatures lower than -35), all the vapors and exhaust churned out from homes, cars and powerplants become visible.

It's a cosmic joke, a dirty trick hatched by physics and burning hydrocarbons. Tiny droplets of water, the size of dust motes, hang suspended in a dark, eerie shroud while we grope and stumble along city streets. The amount of water pumped into the atmosphere produces even stranger artifacts. Left idling while the driver is away, tailpipes of some cars create solid icicles, as thick as a man's wrist, linking the machines to the ground.

In an earlier day ice fog was called habitation haze. Wood fires, cooking vapors and the exhalations of pioneer Alaskans and their domestic animals lend a pastoral flavor, a soft focus, to winter scenes preserved on film.

Today it's a matted fur that crawls in with the beast. With a high-pressure

system stalled overhead, the fog won't lift or blow away. A fearful gloom buries streetlights, road signs and neighborhoods under a cold wrap. Air monitors report a growing pollution index. In the urban area the sun, moon, and stars cease to exist. The coarse breath and angry bite chase the agile and keep the rest inside marking the days. It's nuclear winter without the explosions.

Driver anxiety in ice fog is measured in elevated blood pressure and insurance premiums. Landmarks are sensed rather than seen. Headlights swim through the soup, but it's the wavering red taillights I strain to see.

Bearing through the icy curtain with certainty, hi-beamed juggernauts on big tires swing by fast on the left. Cars in my lane move like blind pedestrians toeing the curb. It's "Wheel of Fortune" out here; hesitation or conviction, it's a matter of script. To rear-end or the victim be: that is the question.

Straining through the fog without vista, the defroster a blanket of white noise, a sense of detached aloneness overcomes me and intensifies the isolation. Existence balances on an ever-receding abyss, forcing me awake and eager for stimulation. I don't

blink for fear of missing the smallest detail. My hundred-mile stare is good for twenty feet. I pull up short just as a "North To The Future" bumpersticker materializes on a Jeep stalled at a green light.

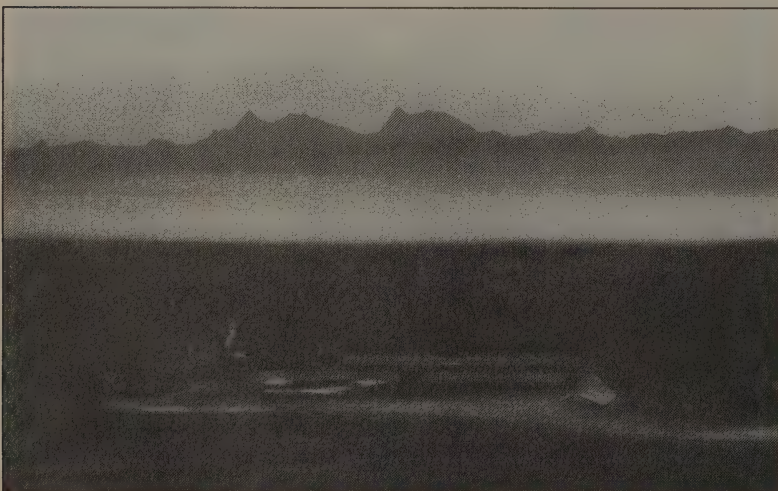
A pilot told me that driving in thick ice fog threatened the same vertigo he felt flying at 9,000 feet in a blinding whiteout. That confirmed for me the notion that living here sometimes means not knowing which way is up.

For some teenagers in high school, that seems to be the case. Out of step with the environment and coerced by national advertising's seductive images, they stand at the bus stop, cold as Christmas, dressed for weather in Tucson. In the frigid exposure unprotected heads radiate visible heat waves like the exhaust of clean-burning chimneys. Denying vulnerability, obvious newcomers, they taunt the cold with youthful conceit and ignorance. Cumulative cold-stress will attack their immune systems in years to come. Passers-by, with more than one season under their hooded parkas, shake their heads at the folly and hurry on.

The democracy of cold alters attitudes about our castles and possessions. Electronic security systems befuddled in the cold can lock people out of their homes. Standard door locks that operate at minus-30 may fail at minus-60. As the temperature bottoms out, fears of theft and trespass fail to apply. House keys become relics and many doors, though closed and snug against the beast, offer sanctuary to all in proximity.

Every time I open the door to my truck I'm reminded of the Little Engine That Could. Turning the key proves it a marvel of reliability, but at what cost? Mechanics who keep the fleet on the road mention cavitation as the cause of metal failure. Oil jellies up in the crankcase and the moving parts, good little soldiers, march off to a quick death in scorched oblivion.

A walk through a parking lot as commuters head home makes experienced ears cringe. Mechanics shake



One hundred miles to the south, the peaks of the Alaska Range form the skyline over which the winter sun rises and sets. Collecting in the lowest and coldest pockets, a layer of ice fog spreads out across the Tanana Basin.



Eighty miles north of Fairbanks, the Yukon River bridge, built during the construction of the Alaska oil pipeline, carries traffic north toward Prudhoe Bay. The frozen Yukon River, running west toward Nome and the Bering Sea, was once a highway for men on bicycles. Intent on reaching the next strike, and with dog teams in short supply, some gold miners employed "wheels" to make the journey.

their heads at the carnage suffered by internal-combustion engines in these conditions. Some say that until oil reaches operating temperature each minute equals 5,000 miles of normal wear.

Parking lots are also graveyards for "snow snakes," dozens of coiled serpents in frozen repose. Broken fan belts are forensic evidence of the struggle waged against cold. Each is a ticket to entropy, each an entry on a mechanic's waiting list.

At this end of the calendar, the sun sets at midafternoon. Turning home, I'm glad to see the ice fog thin to a skein above the highway. December's full moon, bold and clear, rises in the east, reversing shadows

cast an hour earlier by the sun. Pastel lavenders backlight the birch uplands of the Chena River drainage in a convincing charade of warmth and nourishment. The color is so rich in potential, the moonlight such a benevolent gesture, the temperature's paradox so complete, I struggle to contain both realities.

From a shoulder above the valley floor, a vantage of Mt. McKinley, 120 miles to the south, is revealed. Called Denali, the great one, by Athabascans, its silhouette looms like a foreign presence. The deep cold layers of thermal inversion optically distort the mountain's familiar profile into a strange mesa of staircases and right angles. Sometimes the twin

RUNNING errands on the street I pass strangers with

grey, blotchy faces. This is frostbite. White people may say to each other, with a nod to call attention, "Bit of frost there on your nose and face," and keep walking. I've seen Athabaskan Indians meet, pull off beaded moosehide mittens, and press palms to another's face, all the while talking about something unrelated.

summits, in a conspiracy of cold and distance, float clear of the massif like islands in the sky.

On a slope near Ester Dome, 12 miles south of Fairbanks, I park. At a black extension cord, snaking down the hill and across the snow heaps, I plug in. A vehicle will not start the morning after 70 below unless equipped with a small heater and pump to warm its fluids. By plugging in I hook up with a network of connections, conveniences and dependencies that order modern existence at this latitude.

One winter, before electricity reached this corner of Alaska, I coaxed the truck back to life after an extended cold soak. In a cookie pan I loaded coals from the woodstove and in gloved hands carried the smoking prize to the hypothermic vehicle.

Placed with careful attention below the frost-covered crankcase it was at once a practical measure and a ceremonial offering: primitive gifts and ardent wishes to loosen industrial juices. On bended knees I noticed that a cookie sheet tends to slip away on a slide of melting snow, scorching tires and blistering fenders. Not convenient, not without risk, but highly effective if you're determined to warm a stable of horsepower, achieve ignition, and make a run to town.

A neighbor says he's up to here with Alaska, pointing to a ragged bite of frostbite on his nose, and that come spring it's Mexico for him. His timing's off; winter's gauntlet has broken his stride. Romantic notions of "The North" have left gaps in his view of the land's real dimensions. Like the Siwash alcoholic whose core heat flushes to the surface in false warmth, my neighbor has misjudged the consequences of geographic intimacy.

I think it's just "winter talk" and by July he'll be whole again. Open water and twenty hours of sunlight refute the power of negative numbers. The memory of having touched the beast and lived in its shadow will prosper into a fine wisdom. ❧

Secrets of Warmth

The cover says "Never Be Cold Again!" A worthy goal, useful for skiers and ice-skaters of course, but also for construction workers, street vendors, football spectators, and just about anyone who desires to remain comfy and safe when temperatures fall. The advice is given along with the logic behind it, so you really learn something. Good advice it is, too (I say this having lived outdoors in Alaska for several winters). There's an especially good discussion of vapor-barrier clothing, a concept whose time has arrived.

Even if you live in Key Biscayne, you should know how to keep warm — it's part of your basic knowledge base, like knowing how to swim. This easy-to-read book is just what you need.

—J. Baldwin

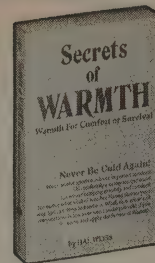
- Some campers eat their supper very close to retiring for the night, causing the digestive system to do work which results in some extra heat. (Protein requires more work to digest than carbohydrates, so it creates a bit more heat from your stomach.) A snack or a hot drink would do almost as well.

- Extra (thick) covering for the head (and neck) is an absolute essential for survival equipment. As stated above, the head can lose an enormous amount of heat if not well insulated from the cold. Blood flow to the head is never slowed, so no heat is saved by vaso-constriction as it is in the extremities. The head has almost no fat, and only an extremely thin muscle layer to act as insulation, and human hair is a very poor insulator. The skull bone is (unfortunately in winter) a good conductor of heat away from you. In any cold emergency, the head should be insulated at least as much as the body. Therefore, you should have thick (preferably 2" or more) insulation available for your head and neck area in an emergency.

- A cold weather mask is available from the 3M company and a foam mask is sold by Spenco. This item weighs about half an ounce and can have a huge impact on lowering your heat loss during an emergency.

In a survival condition, when you are inactive and are trying to conserve body heat, you are losing about half your heat output through your breathing. You are also losing water through your breath. The cold weather breath mask slows both of these losses considerably. I consider this item to be another must for cold weather survival gear.

(Since a vapor barrier suit can weigh as little as seven ounces, a foam pad can weigh between 8 to 16 ounces, extra insulation for the head is about 6 ounces,



Secrets of Warmth

Hal Weiss, 1988; 190 pp.

\$8.95 (\$10 postpaid) from Vibe Publications, 1671 E. 16th Street/Suite 195, Brooklyn, NY 11299; 718/253-2939

and a cold weather breath mask weighs less than an ounce, and since they can conserve so much heat, no serious cold survival gear can be considered complete without these four items!)

- Unfortunately, the metal skin of the car is a great conductor of heat (away from you and into the environment). Since snow is a good insulator, it's a good idea (if you are up to it physically) to pile snow on the car if the outside temperatures are below 20 degrees. Use a shovel, or hub cap, or anything else you can improvise to build up the snow to a foot or more in thickness. Don't compress it or it will lose its insulative value. Again, remember to mark the car so you don't get crushed by a plow.

If you have extra clothing put it on before you feel cold; DON'T WAIT! If you have newspapers in the car, start crumpling up the sheets one by one and place them around you. Stuff a few into your jacket if you have some room, and also in the legs of your pants if possible.

Insulation required at various temperatures

Effective Temp.	Sleeping	Light work	Heavy work
+40°F.	1.5"	0.8"	0.20"
+20°F.	2.0"	1.0"	0.27"
0°F.	2.5"	1.3"	0.35"
-20°F.	3.0"	1.6"	0.40"
-40°F.	3.5"	1.9"	0.48"
-60°F.	4.0"	2.1"	0.52"

One good point that the chart brings out is that you can sleep outdoors in safety (if not perfect comfort) at 60 degrees below zero with only 4" of insulation around your body. (Personally, my mind balks at that figure and demands something more like 6" to 8" for enough comfort to be able to sleep.) Many people think it's impossible to sleep outdoors in that kind of temperature, and this information breaks through a lot of preconceived ideas about the cold.



WILL WE NEVER SHUT UP ABOUT ZINES? PART XXIV

BY MIKE GUNDERLOY
AND CARI GOLDBERG JANICE

WHATEVER the topic, there are outlaw publishers on the fringes of the periodical world, staying up long hours to put their own visions on paper for the pleasure of a handful of readers. These are the zinemasters, those who relate directly to their readers. Questioning technology is a popular activity on the fringe, and here are some of the best questioners.

Remember, these are amateur periodicals, so be patient when you write. Send a stamped, self-addressed envelope if you want more information. Send well-wrapped cash, or checks made out to the person doing the publishing rather than to the zine, which probably doesn't have a bank account.

Mike and Cari are working on a book for Viking Press: *The World of Zines*, due to be published in fall 1992.

Factsheet Five is now published by Hudson Luce, P. O. Box 1163, Cincinnati, OH 45201. Send \$3.50 for a sample issue.
—Howard Rheingold

Fifth Estate

\$1 from 4632 2nd Avenue, Detroit, MI 48201.

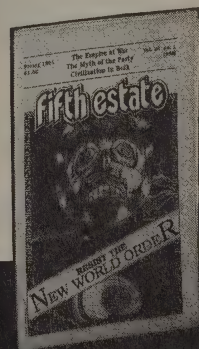
Fifth Estate has been around for over 25 years, gradually evolving from a relatively standard underground newspaper to a thrice-yearly questioning of almost everything — even such things as language and numbers have fallen under scrutiny in their pages. Often accused of being merely antitechnology, they are in fact sophisticated theorists and observers, equally at home condemning the megamachine and the macho excesses of redneck environmentalists. The writers here are also activists, putting their bodies on the line in front of garbage incinerators and other unsavory manifestations of technology. Sometimes difficult to digest, *Fifth Estate* consistently provokes me to go beyond questioning technology and wonder what might be done about it.

After a strong campaign by mainstream ecology groups, the McDonald's Corporation recently agreed to stop packaging its hamburgers in environmentally damaging styrofoam containers. Although McDonald's cynically stated that its decision was based solely on public relations factors rather than environmental ones, it is able to present itself as a responsible corporate citizen.

What went unchallenged, and was hence affirmed by the environmentalists who struck the deal with McDonald's, is the corporate domination of food and its accompanying industrialization, the wretched

quality of what is served, fast food's role in further reducing the conviviality of meal taking, and the ecologically damaging process of beef production. Had groups like the Environmental Defense Fund raised any of these issues with McDonald's, the door would have been slammed in their faces.

What would an authentic Earth Day look like? Wouldn't it look like a general strike, a moratorium on production, a reduction of mechanical movement and with it of the industrial noise that drowns out the wind, when all of the former cogs of the megamachine take a long look at the world, perhaps for the first time, and begin the process of becoming living subjects once more? Wouldn't they engage one another in a face-to-face discourse for the first time, taking stock of hands and feet and head and heart as the real material bases for a new society? Wouldn't they simply ignore the television stations, rather than attempting to capture them to broadcast the pronouncements of the latest revolutionary-industrial junta? Wouldn't they begin to retrace their steps, back away from the edge of the precipice, turning things off and beginning to rely on their communities and their own human powers to meet their few trifling needs so as to get on with the real adventure of living, of singing, of dreaming? And that first night — wouldn't the sky be dark and beautiful and studded with stars for the first time in memory? Wouldn't a different language, spangled with eternity, find its way into daily discourse as the conditioning of industrialism and manufactured values began to be shed?



Why the U.S.

Destroyed Iraq



Underground Beat

\$5 (4 issues; make check payable to Beat Club Productions) from 1718 M Street NW/Suite 154, Washington, DC 20036.

A relatively new publication with a vision to rival the most righteous radicals in the small-press scene. These folks see themselves "banging the drum of protest" and they pack a reality punch that forces us to ignore or at least postpone our daily doings. And these guys are not foolhardy layout artists. Each article, whether about the enormous disinformation resulting from the Persian Gulf war, the Eastern tradition of herbal medicine, essays on computer hackers and crackers, comics, or even reviews, is intentionally and strategically placed so we feel a kind of rhetorical gaze motion occurring. Indeed, the star of Issue 2 is John Perry Barlow's "Cybercrime," a series of essays on dealing with the legal and ethical implications and accusations of hackers and crackers. Four such essays are inter-

Ones & Zeros

\$2 donation for sample issue. Campus Forum on Responsible Technology, NM Union Box 95, Albuquerque, NM 87131.

Ones & Zeros comes from an academic environment yet is anything but academic itself. It explores the boundaries of technology as it hurts human lives, in a mix of essays, interviews, photographs, short stories and poetry. The tone is mainly one of thoughtful opposition, recognizing technology as one of the ultimate human activities but also as a great threat. This is criticism of technology that does not lose the human dimension of the critics; *O&Z* is as likely to reprint material from e.e. cummings as to conduct a debate on the merits of the human genome project.

In compensating for the harm humankind has inflicted on itself through over-extension of technique, it is imperative that we do not simply resurrect technique with new window-dressing. This tendency is evident in the eagerness of many communities to

develop extensive recycling programs, replete with increased waste-transportation traffic, new bureaucratic structures, and penalties for non-compliance. The recycling mania and related liberal-environmentalist band-aids illustrate the special relationship that has always existed between ideologies of "crisis" and the growth of evermore unmanageable systems. Rather than instituting yet another industry ready to fall prey to the profit-filterers, we should recall the need to return control of technological solutions to the individual. For instance, what about arranging community-based non-profit manufacture and distribution of non-disposable containers. Yes, the food manufacturers would balk, the packaging industry would collapse, grocery chains would have to adapt to distribution without separate packaging — but that's really the point.

In fact, after several generations of "technological progress," we have become a people who cannot think about anything of lasting value or importance. Our poli-

ticians are bureaucrats or apparatchiks whose concerns for re-election or accumulation of personal wealth have replaced concern for their constituents. Our philosophers are sub-analysts caught up in the obvious quandary of language. Our scientists are specialists stuck in tangled theories concerning very little of present importance or impact to human life and our historians, journalists and writers have sacrificed the value of substantial thought for style. As for the rest of us, we are, for the most part, incapable any longer of asking about the value of our lives, usurping such questions with a barrage of technical or meaningless data, from the stats of a Hollywood star, to the latest and best of technological innovations or discoveries, like a great new Cuisinart that doesn't make the quality of your food better, but gives you more time to produce or consume other projects, though certainly not think.

We are rabbits in the headlights of our own technique.

persed among nontechnological articles. And wisely so, since all of Barlow's data at once would leave us in Hacker Viewpoint Shock. Crackers and their less dastardly cousins, hackers, are carefully and astutely handled by "alternative culture's loudest writers and artists." It was getting kind of quiet out there, too.

Cracking impulses seemed purely exploratory, and I've begun to wonder if we wouldn't also regard spelunkers as desperate criminals if AT&T owned all the caves.

Nearly all publications are now electronic at some point in their creation. Is the Wall Street Journal now unprotected by the 1st Amendment as it travels the wire to its various printing plants?

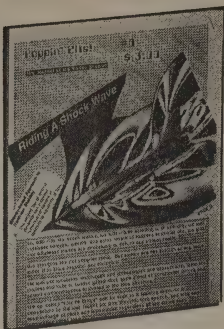


Poppin' Zits

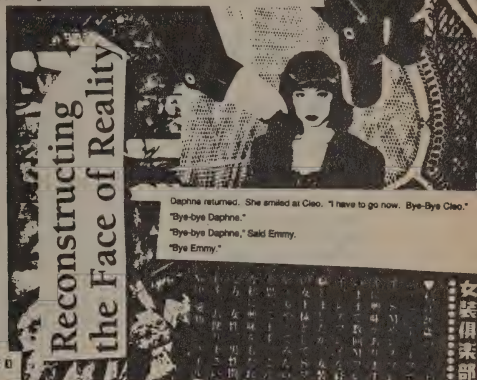
\$3 from Jerod Pore, 1800 Market Street #141, San Francisco, CA 94102-6227.

Sometimes it's hard to tell whether Jerod Pore is a critic of technology or one of its casualties. He hangs out in a shadowy world of high-tech advertising, computer viruses, foreign cultures that threaten to overwhelm ours and "Invisible Literature" — trade magazines directed at all sorts of narrow vertical markets. It all comes together in the wild punk-collage pages of *Poppin' Zits*, a zine photocopied on multicolored paper and loaded with theories and conspiracies for tomorrow. Reading *PZ*, one gets the impression that the world has already come to an end, and all that remains is for the pieces to finish falling to the ground.

Fear and needs are pretty basic concepts, but what I find fascinating are the contemporary manifestations of the sources of the various fears and needs I've listed, and the appropriate tribal response to said fears and needs within the corporate setting. Against these modern manifestations of ancient fears, the Tribal organization pattern also allows people to fill specialized positions of psychic defenders. Geeks like me, to whom the others turn when the



whatever you do, don't... let parts of truth, misdirect." To Daphne live in Anica:
 "Oh! Africa. Do you know Princess Bevin?"
 "No, I've never had a chance to meet Princess Bevin."
 "Would you like to know a secret?"
 Emmanuel whispered, "She really likes you."
 Cleo said, "Yes, Daphne, I would like to know a secret."
 "My Mommy. Well, she's not my real Mommy. My pretend Mommy would put things inside of me to make me pee."
 Cleo was stunned. She fought back tears. Emmanuel was screamwhispering "I need details."
 "What kind of things, Daphne?"
 "Yucky things. Do you want me to show you?"
 "Show me? What do you mean?"
 "Daphne, do you want to draw the things."
 "Yes, Emmy. Do you want to see me draw Cleo?"
 Cleo nodded. Daphne's image faded out. On the screen she drew passable pictures of enema bags and blunt phallic objects that could serve any number of other purposes. "You draw very well Daphne," Cleo said, masking as best she could the anguish she felt.



dreaded virus starts infecting every suspect disk. I AM the Silicon Shaman, and when the viral paranoia (aggravated by the twin vectors of AIDS and immediately inexplicable entities like the worm Robert Tappan Morris spawned into ARPANET) peaks, I'm expected to exorcise the systems upon which the livelihood of the Tribes depend. Warning: I think the following observation is blatantly skewed by my own fetish fears and such, but here it goes. The modern vision of the Shaman is most eloquently expressed in the belying purity of the higher technologies, an ultra-frequency harmonious convergence of electronically enforced hierarchies, of CyberSpatial landscapes encompassing endless sexual possibilities, the archetypal oracle of hidden and often forbidden knowledge that wields tight control over the fortunes of these new feudal kingdom entities, and the quasi-mystical biological and silicon viruses that fill the role of randomly and usually malignantly acting supernatural beings.



Intertek

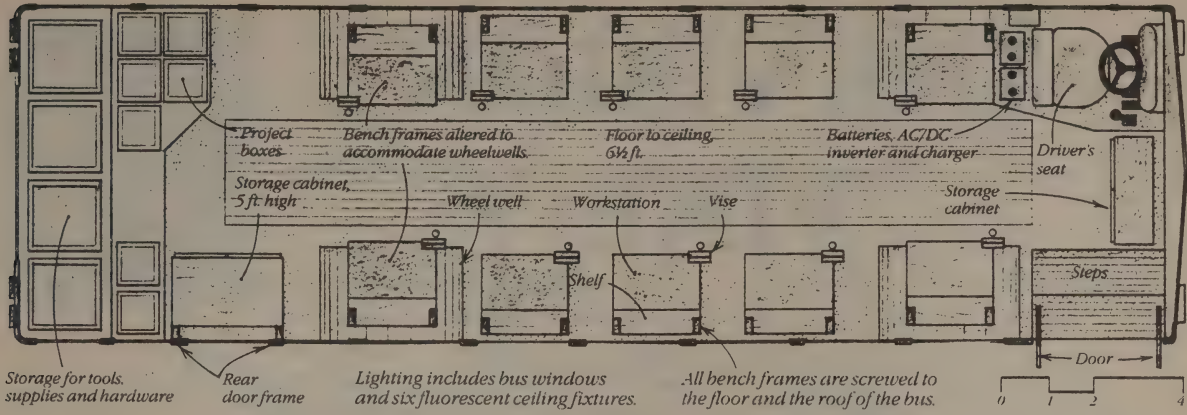
\$3 from Steve Steinberg, 325 Ellwood Beach #3, Goleta, CA 93117.

The editor, et al., of this "cyberpunk journal" seek out articles and essays on the research and development of high

technology — computer hacking, encryption, cryonics, drugs. These are serious topics, and they are presented and discussed with wonder, intelligence and relish. Each area discussed is discussed again, from another (usually opposing) viewpoint. This is an excellent source for anyone involved with technology, professionally or otherwise.

The cyberpunk genre, a genre INTERTEK fits into, is often accused of ignoring ethics. Of being too excited with new technology to see the potential dangers . . . many of us are in fact concerned with the morality of high technology. The consensus seems to be that ethics are crucial but they must not simply serve as an excuse to stop progress. ■

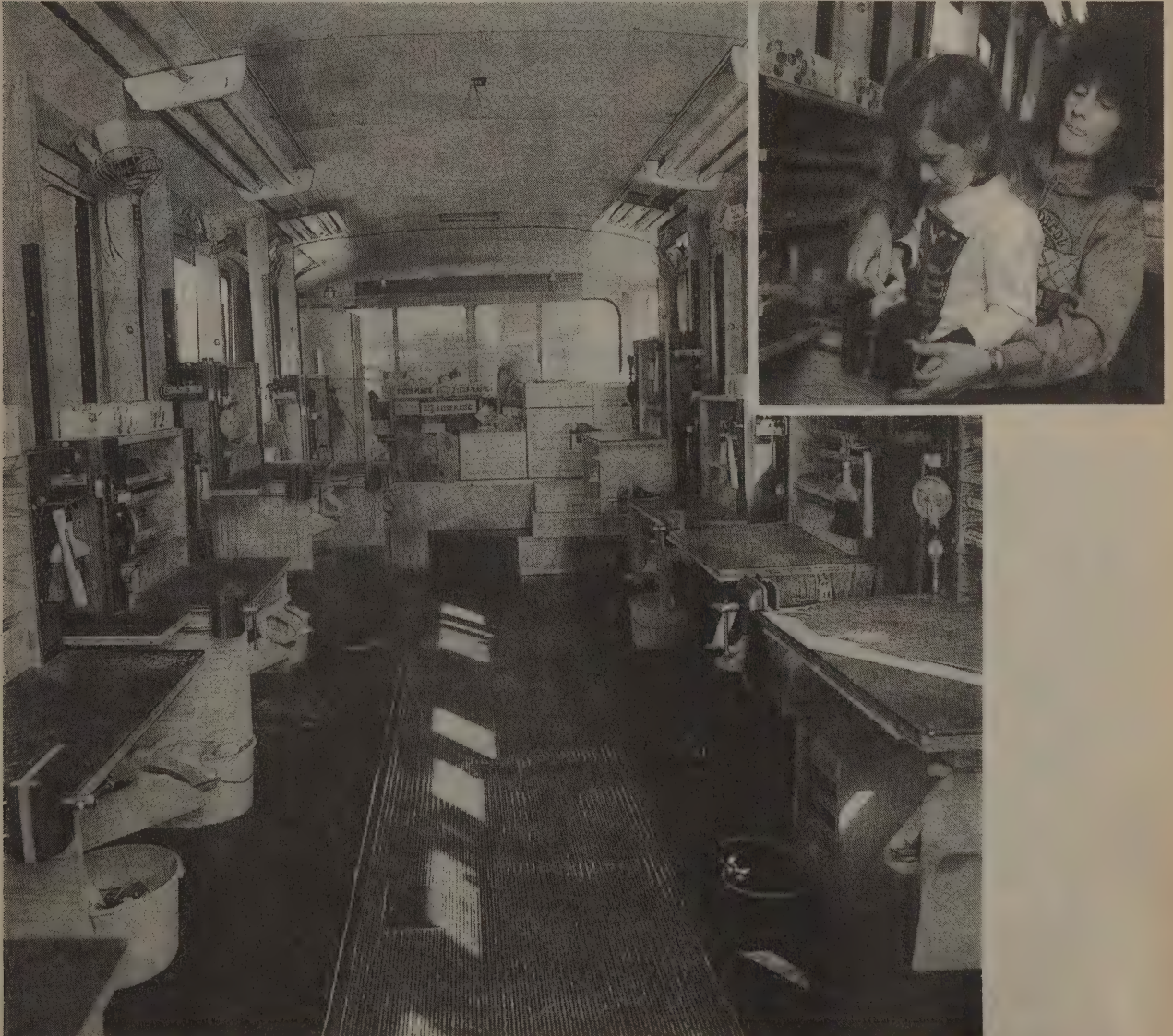
Sheila Dawson's workbus for children



Sheila Dawson's converted city transit bus provides ten workstations, and she provides encouragement, instruction and a watchful eye.

Many kids love to work wood as much as adults do. Sheila Dawson, lending a helping hand to Arielle Morrison in her schoolbus workshop [inset], has introduced wood-

working to San Diego children with her innovative program, "I Can Build It Myself."



THE VISION VINE

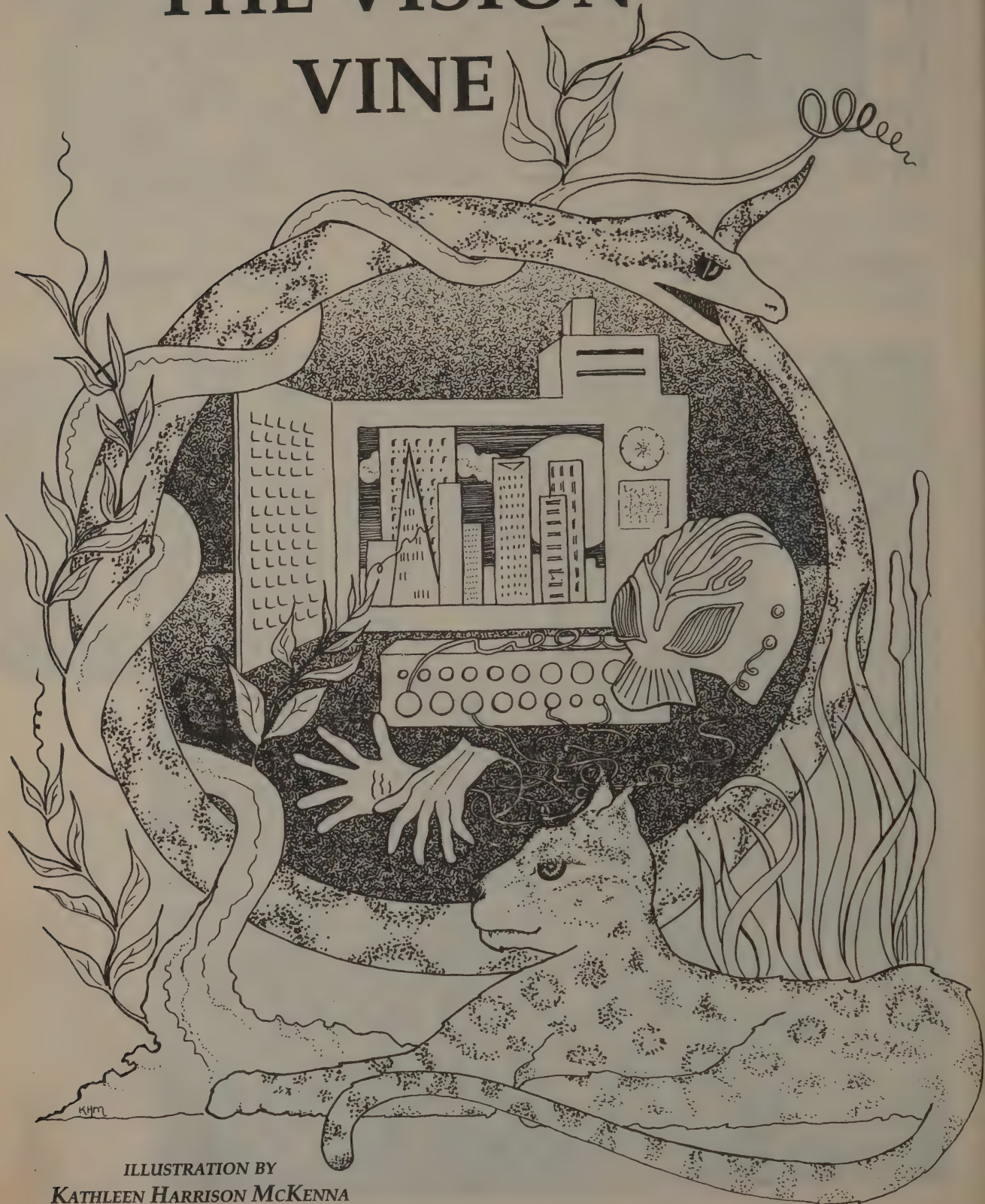


ILLUSTRATION BY
KATHLEEN HARRISON MCKENNA



TELL US what you have seen in the other world."

The warrior faced the chief and began. "Many times I have journeyed to distant lands, where the people do not speak as we speak, or live as we live. But *this* world was unlike any I have seen."

Outside the hut young Achuar hid, listening intently, occasionally daring to peek through a gap in the wall. One day he would be allowed to sit at the council of elders, but he could not wait until then. Something unusual was happening, something that could disturb the way of things.

"Their world is so strange that my memories evaporate like dreams." The warrior closed his eyes for a moment, then continued. "The light is bright and painful; the sound is harsh, confusing, loud like the thunder. There is no green life.

"The people have wondrous spirit tools which turn their thoughts into visions, their words into objects. They create unreal places and then live there. They do not live as humans."

Achuar tried to imagine the other world, but he could not. What he would give to go there and see for himself! Perhaps one day he could. He forced himself to breathe slowly, silently.

"Where is this other world?" asked one of the elders.

"I do not know the location," replied the warrior, "but it must be very far, beyond the water."

Achuar braved another glimpse through the gap. He had never seen such sadness in the chief's eyes.

The chief frowned, deepening the creases of his face. He spoke slowly. "The other world is here, where we now sit. The people have powerful magic and terrifying weapons. In time, they will destroy us and our world."

The others sat in silence, pondering the chief's words. Achuar's legs began to tremble, and his eyes clouded over.

How could this be possible? He loved his world. Surely it would last forever.

"Is there nothing we can do?"

"We can hunt and fish and gather plants," said the chief. "We can celebrate life and honor death. We can laugh and find joy even within the sorrow of our lives. If we follow the ways that we have been taught, our spirit will live, and our world will be reborn."

The chief lowered his head and spoke softly, as if to himself. "But if we lose our way, our world may be lost forever."

The council was ending. As Achuar crept away from the hut, a dog saw him and began barking. Achuar ran and hid in the shadows at the edge of the forest. His heart was pounding. Had they seen him?

He followed a path into the woods. How could this other world be right here, all around him? It didn't make sense.

He stopped and stared as hard as he could, but he could not see it.

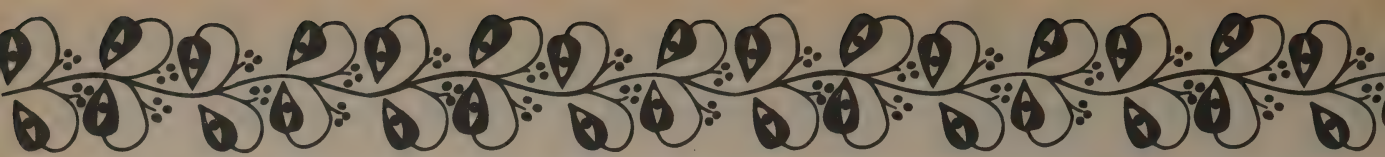
Instead, he spotted some fresh paw prints — a jaguar, apparently in no great hurry. Achuar found a suitable branch and made a spear. It was unlikely a jaguar would attack, but if it did he would kill it and make it his ally.

He followed the tracks, deeper into the jungle. Surely there was some way

BY EARL VICKERS

"Their world is so strange that my memories evaporate like dreams."

Earl Vickers does audio consulting for computer games. He recently spent a year in Costa Rica and produced a binaural-stereo recording of rainforest sounds ("It's a Jungle In There," \$10 from Tapir Tapes, 6171 Bernhard Avenue, Richmond, CA 94805).
This fantasy is, I fervently hope, the last thing we will publish about virtual reality.
—Howard Rheingold



he could save his world. Perhaps if he went to the other world and talked to the people there, they would understand. Then his world would be safe, and the chief would thank him and teach him the secrets of the tribe. And he could marry Isha, the chief's youngest daughter, if he wanted to. He would have to give it some thought.

Achuar passed an abandoned hut in a small clearing. Sniffing the ground, he realized the jaguar must be very near. He walked further, stopping every so often to listen.

In the distance, a pya-pya took flight with a harsh alarm cry. Achuar strained to see and finally spotted the jaguar. He felt very fortunate.

Slowly he approached, walking almost silently. The jaguar was eating something, a plant, some kind of vine. *The vision vine.*

He could see ripples coursing through the jaguar's body as it coughed up what it had eaten. Then, as if realizing it was being watched, it turned and stared straight at the boy. Achuar froze, frightened for the first time. He held his spear tightly but knew it would be worthless.

They're as scared of you as you are of them, he told himself, but the jaguar did not look the least bit afraid. Achuar turned away, avoiding its gaze. When he looked back, the jaguar was gone.

Achuar reminded himself to breathe and congratulated himself on his bravery. *I was not really afraid, or I would've run. Instead, the jaguar ran from me.*

He waited for a long time, then walked slowly to the spot where the animal had been. He had never heard of jaguars eating the vision vine. Perhaps they ate it for

the same reason that the chief and the other shamans did.

Achuar picked up a piece of the vine, examining the teeth marks. *Maybe if I ate the vision vine, my vision would be sharp enough to see the other world.* He knew that eating the plant without supervision was forbidden. But these were not ordinary times. The fate of his world was at stake. Maybe if he followed the ritual as closely as he could, it would be all right.

He gathered up several long pieces of the woody vine and returned to the abandoned hut. Out back, he found a clay cooking pot full of rainwater. He sat by a large boulder and used a rock to pound the vine into small shreds, as he had seen it done. Then he put the pieces into the pot and started a fire beneath it, adding a few chacruna leaves to brighten the visions.

While the pot boiled, he explored the area around the hut. There were many edible plants, but he refrained from eating, even though he was hungry. The ritual required eating the vine on an empty stomach, in a quiet place, at night. The sun was already starting to set. He knew the vine would enable him to see in the darkness.

Soon the brew was done. He took it off the fire and let it cool, hoping he had prepared the right amount. Too little and nothing would happen; too much and he could wind up unconscious on the jungle floor for a week. Or forever.

He'd heard that the vine tasted terrible. He braced himself and drank a large mouthful, straining it through his teeth. He tried to keep his intent pure and his courage strong, but the taste was even worse than he had imagined. He almost vomited. *Not yet,* he told

himself. He spat out the fibrous particles and swallowed another mouthful, and another, until it was all gone.

Within minutes, he began trembling and perspiring. *Perhaps I've drunk too much; maybe I'll die.* He decided to remain calm and brave to the very end. He sang softly to relieve his fear and summon the visions.

Suddenly he realized he was being watched. He knew what it was and turned to face the jaguar, less than twenty paces away.

"You have eaten the vine of death," said the jaguar. "I am your death, whom you have summoned. Look into my eyes."

Achuar looked away. *I am not afraid,* he told himself. *I am brave.*

The jaguar roared with laughter. "You're shaking like a leaf, because you know I'm going to pounce on you and rip you with my claws and eat you alive. I will kill you and make you my ally!"

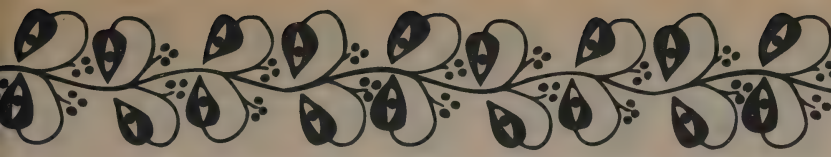
Achuar convulsed, simultaneously vomiting and defecating. The jaguar laughed uncontrollably, pounding the ground with his paw.

"I am not afraid," mimicked the jaguar, in a sing-song voice. "I am brave." The jaguar laughed again, a roar so loud that Achuar felt the earth shake.

"Well, maybe a little afraid," admitted Achuar. Now he realized that the jaguar had just been playing with him.

The cat laughed once more. "If I had wanted to eat you, we would not be having this conversation."

I have spoken with a jaguar. This was a very high honor, a good omen. He looked up and stared deep into the jaguar's eyes.



Reed took off the headset and looked around at the lab: tangled wires, stacks of circuit boards, computers with their covers removed. Reentry was always disconcerting, but never like this. *The sign of a well-made reality.* He noted a foul, metallic aftertaste in his mouth.

A commercial was blaring from the radio. Everything seemed harsh, ugly. He reached for a bottle of noise-killers.

"Interesting," said Derek.

Reed jumped slightly. He turned to face Derek, his boss — middle-aged, balding, a little on the heavy side. "You were monitoring it?"

"Yeah. The jaguar was a nice touch; I'd never seen one up close."

"I just threw it in. Some guy on the net had the code for it, and I realized I could use it to lead the boy to the vine."

Derek frowned. "Oh, yeah, the vision vine. That's a problem."

Reed looked at him in disbelief. "It's a simulation; it's not an actual physical substance. And even if it were, it's nothing but brain juice. I dug up some old research on it." Reed selected an article and displayed it.

"Principal active ingredients: harmine, harmaline, various analogues." Derek scanned the article. "Harmaline . . . produced *in vitro* by incubation of serotonin in pineal tissue. Isolated 1923, originally named *telepathine*. Interesting. Any studies on it?"

"No, but there's lots of anecdotal evidence. All through the Amazon basin, the ayahuasca plant was used for remote viewing, diagnosis, and healing. If someone was sick, the vine would show

them which plant would cure it. The thing is, there's nothing in it that's not already in the brain."

"So we've got our own built-in controlled-substance factory, huh?" Derek laughed. "I'm not surprised. But here's the thing. We get enough flak as it is, even without poking around in brain chemistry. You know — the realities are addictive, degenerative, a menace to society . . ."

"You forgot to mention, mindless pap for babysitting a bored populace."

"Look, I want you to forget about this one. We don't need the lawsuits. And there's no market for it anyway. People don't rent realities so they can have a pleasant evening vomiting all over themselves."

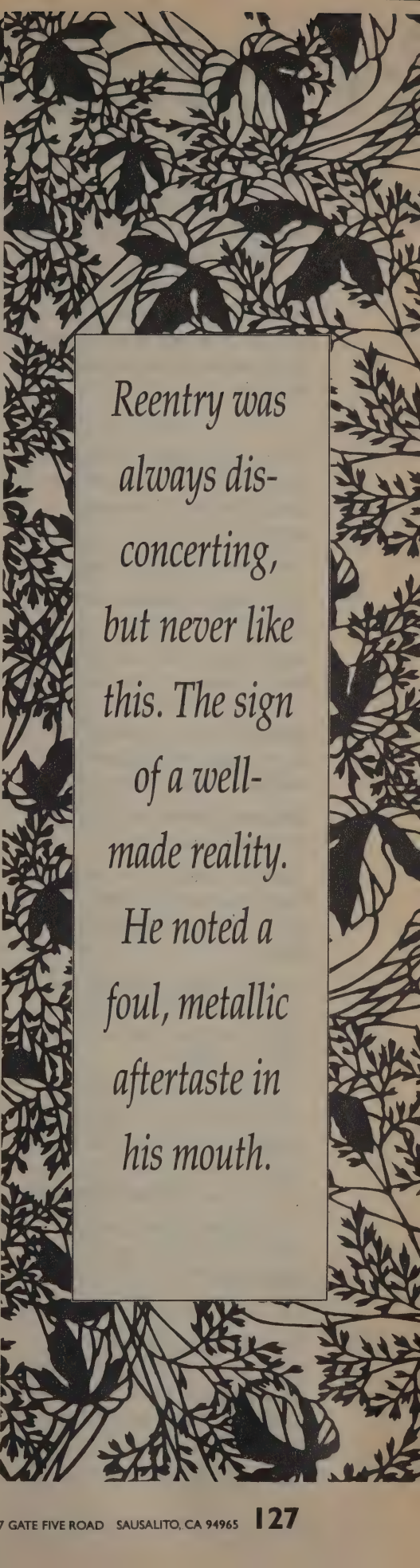
Reed shook his head. "You don't understand. The natives believed that all living things were interconnected, that there was a nature spirit that could speak to them, literally. Now that the natural world is gone, people are hungry for some way to reconnect with that spirit."

"Sorry, Reed, but people aren't buying that mystical nature crap any more. I'm cancelling the project." Derek started to leave, then turned back. "Listen, I don't want you going in there again and getting lost. You did a damn good job, maybe too good. Go in unmonitored a few more times and you won't remember whether you're dreaming the kid or he's dreaming you."


Derek left. Reed paced around the room, then smashed his fist on a lab bench. *All that work for nothing.*

He walked over to the system and checked to see that Derek had left for the day. He picked up the reality cartridge.

What if Derek is right? There is



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something different about this reality, something powerful about that vine, even in simulation. Still, I know my way around; I'm not going to get lost in some strange loop.

He inserted the reality into the system. *I'll just go in for a few minutes, touch up some stuff.* He put on the headset and started the program.

Reed walked down the trail, enjoying the rich, musty smell of the jungle. He tried to visualize where he was.

"Let's see an overhead view."

The system responded accordingly.

He pointed at the map. "Okay, how about a trail from here, cutting over to the lake. Yeah. And then it goes back up and reconverges with the main trail, right about here. Okay, good."

The map disappeared. Reed explored the new trail.

"And how about some more birds? Something colorful. They could feed in that fig tree over there."

A pair of scarlet macaws flew from one branch to another, displaying brilliant flashes of red, blue, and yellow.

Continuing down the trail, he almost stepped on a napping bushmaster — about eight feet long, if uncoiled, and very deadly. Camouflaged to look like dead leaves.

"Jeez! I thought we got rid of these. What is this, spontaneous generation?"

The snake disappeared.

Reed looked up at the forest: trees, vines, orchids, flowers, life intertwined all around him. He inhaled deeply. *The world used to be like this.*

"Let's go into character." He felt

the usual tingling sensation as the system downloaded his new identity.

Achuar sat up and rubbed his eyes.

What strange visions this vine produces! And the other world — such a terrible place!

He wondered how long he had been lying there. He saw the jaguar in the distance; perhaps it had been watching over him the whole time.

Already the bizarre images were fading from his mind, but he knew what to do. He would sing the icaros, the magical songs he had heard in the other world. These would keep the pictures from disappearing.

As he sang the icaros, frightening images began to return. Tangled vines with no leaves. Shiny objects for which there were no words. The false jungle, with birds that appear and snakes that vanish. And the strange people. Achuar shuddered.

Who are they? he wondered. *Most likely they are not people at all, but evil spirits, to live in such a dead place, with such powerful magic. They will never listen to our words. We must fight them and destroy them before they destroy our world.*

Achuar decided to tell the chief — he would know the meaning of these visions. The chief would be impressed by Achuar's bravery, and perhaps something that Achuar had seen would help save their world.

He made the long journey back to the village. The chief's daughter Isha was sitting in the courtyard; she pretended not to see him. As he approached the chief's hut, he pondered what to say.

"Achuar."

Achuar flinched and turned around. The chief was standing there.

Achuar stuttered nervously. "I — I went to the other world, so they would not destroy us."

He paused, waiting for some sign of approval. The chief said nothing.

"It was horrible. Nothing made any sense. There was a whole forest, only everything was all wrong. It was scary, b-but I was very brave. And the jaguar talked to me and protected me."

Achuar was sure the chief would be impressed by this last item.

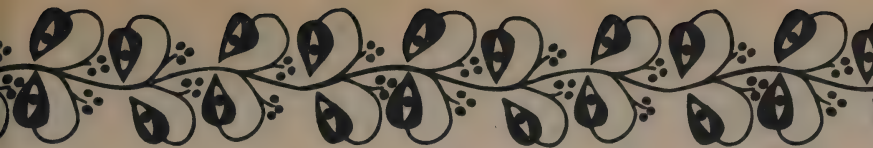
But the chief's face was saddened. "You have spied on a meeting of the council. You have broken the ritual of the vision vine. And you have suffered contagion from your contact with the other world. Your actions may result in the permanent destruction of our world and our way of life. You are banished from the tribe forever."

Achuar stood dazed, looking at the chief. Then he backed away, turned, and broke into a run.

Banished! If he did not leave immediately, he would be killed. He passed Isha. She again ignored him, but this time he saw she was crying. Other children began to taunt him, calling names and throwing rocks.

He fought back the tears as he took the trail to the abandoned hut. He could stay there for a while, but he knew eventually he would have to move further away.

But where? The surrounding villages would not accept an outcast from another tribe. He could live by himself in the forest, but his life would be sad and empty. He would die of loneliness.



If I'm going to die, let me die fighting the evil spirits. This is all their fault. I must return to their world and destroy it.

Achuar found the remains of the vision vine and prepared another bowl. He'd heard that each time you drank it, it tasted worse. This was hard to imagine, but he swallowed a mouthful and found it was true. Summoning his courage, he forced himself to drink the rest of the liquid.

Achuar walked down the trail, hoping to see the jaguar again. He came to a fork in the trail. *I don't remember this path. I wonder where it leads.*

He followed the new path and discovered it was a shortcut to the lake. Leaning out over the surface of the water, he looked at his reflection and saw he was naked.

The spirits in the other world were not naked. They will point at me and laugh.

Achuar began to cry.

Reed removed the headset. His mouth had that dreadful after-taste again, and there were tears in his eyes.

"Reed."

Reed turned and saw Derek. He knew what was coming.

"I hate to do this. But you've wasted company time and money working on a product that could never be released. You've repeatedly violated safety regulations by designing realities from within, with no supervision . . ."

"Wait, Derek . . ."

"And you've disobeyed a direct order to cease work on this project. I'm sorry, but we have to let you go."

Derek stood by as Reed sorted through years of job-related detri-

tus, throwing most of it away and packing up the rest. Neither of them spoke. Reed managed to grab a copy of the reality before he left.

He went home and pondered his future. He had no job, no community, no sense of belonging. He looked around at the rectangular walls, the harsh lights. Everything seemed strange and unfamiliar. *Not a single plant in the whole apartment.*


He missed the other world, the world of trees and flowers, birds and frogs, monkeys and jaguars. Donning the headset, he took the reality he'd smuggled from work and inserted it into his player.

Reed walked down the trail to the lake, trying to figure out what to do next. He leaned out over the water and saw a reflection of Achuar. *That's odd. The pictures must be switched.* He made a note to fix it later. Looking at the image, he felt Achuar's sadness and wondered what the boy was thinking.

"Let's go into character." Warm electrical shivers rippled over the surface of his body during the transition.

Achuar looked out through his tears as the water turned into a lake of golden, liquid fire. Something floated toward him through the flames; it looked like the vision vine, twining around in spirals, swimming closer and closer.

Achuar blinked. Suddenly a giant anaconda wrapped itself around his legs and began pulling him into the water. He screamed and fought back violently, wrestling with the snake, hitting it, clawing at it, trying to pry it loose.



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Nauseated by the serpent's foul stench, Achuar retched. He could feel the cold, clammy scales coiling tighter and tighter around his body, the great weight dragging him down.

He took one large, final breath of air before being pulled beneath the water. Darkness and silence closed in around him. He ceased to struggle. The surface of the lake grew calm.



"Exit character!"

Reed gasped for breath; he had gotten out just in time. Well-done death experiences sometimes proved fatal in real life, due to heart attacks and causes unknown.

This reality's too hard, he thought. There's no way out; the boy is just no match for an anaconda.

Reed sat at the edge of the lake, exhausted. *But didn't the natives use ayahuasca to experience their own death — and rebirth? And didn't they use it to transform themselves into animals?*

"How about a jaguar?" Reed thought aloud. "Go back into character." The tingling started at his ribs and became an oppressive tension in his chest.



The jaguar burst up through the surface of the lake, with the anaconda coiled tightly around its body. Reaching the shore, the jaguar ripped the serpent with its claws, again and again until the anaconda loosened its grip.

The jaguar roared with fury as the snake tensed again, even tighter. The two rolled over and over along the shore, locked in struggle, until the jaguar clamped its jaws around the anaconda and whipped its head against a rock.

The jaguar crawled out from

within the coils and rested, panting. Out of the corner of its eye, it watched as the anaconda stirred and slithered closer once more.

The jaguar snarled and pounced. Seizing the snake by the tail, the jaguar whirled the huge serpent around and around and flung it across the lake.

The anaconda bit its own tail and rolled like a hoop over the surface of the water, which shimmered with a phosphorescent purple glow. The hoop became smaller and smaller as the snake swallowed its tail, its midsection, and finally its own head, disappearing entirely.



Achuar stared at his hands. He could still feel the animal energy straining to emerge; he knew he would be able to call upon the jaguar's power from now on.

He stood by the edge of the lake and gazed at his reflection, but it seemed unfamiliar. *That must be the man from the other world. Perhaps one day I will become a great shaman like him.* Just for a moment, Achuar wondered who was real and who was the reflection.

Moved by the image, he reached out and touched his index finger to that of the man beyond the water. The reflection began to waver, as ripples spread out across the lake. *The two worlds are now one.*

Watching the ripples, Achuar discovered he knew what the man was thinking. He could see Reed's thoughts as visual images, brightly colored, glowing on the surface of the water; he knew that Reed could do likewise. They began talking back and forth in pictures, slowly at first, but soon as fluently as if they'd always communicated in this way.

Achuar thanked Reed for the idea of becoming a jaguar. Examining

Reed's thoughts, Achuar saw the blockages and swiftly rearranged the pictures into a more harmonious pattern.



That's it, thought Reed. His heart pounded rapidly as he suddenly understood what he had to do.

He would recreate the whole reality from scratch, at home on his own system, making it even more realistic. And then he would simply put it out on the net, as shareware. Whoever wanted it could download it, for free. With any luck, it would reawaken people's connection to the spirit of nature and generate new interest in the idea of making the earth green again.

If they like it, they can donate a shareware fee to create a nature reserve. Not just a zoo reality, but an actual outdoor forest, with real live plants and animals.


We can collect the DNA code archives for hundreds, maybe thousands of species, and recreate them in the flesh, with classical genetic engineering. People won't be satisfied with interactive images of nature; they'll demand the return of the natural world.

Reed realized he was clenching his fists with excitement. Looking down at his hands, he noticed scales of snakeskin beneath his fingernails.



Achuar didn't understand all of Reed's thought pictures, but they gave him hope for his world — for both their worlds, which were now one. Watching the ripples on the lake for a moment longer, he said farewell, then turned and took the path to the village.

As he passed the abandoned hut, he saw the jaguar watching him from the edge of the forest. *The*



jaguar is my ally — he must give me a song. Achuar listened carefully. On his way back to the village, he sang the jaguar's song and walked in the animal's tracks.

Isha was the first to see him when he returned. She glanced at him, caught herself and looked away, then turned back and smiled fully, radiantly. His heart filled with happiness to see her again.

A council of elders was in progress. Achuar entered the meeting room but was immediately seized by guards.

"He has been banished," said one of the elders. "Now he must be killed for his disobedience."

"Wait," commanded the chief. "I want to question him." He looked sternly at Achuar. "Why have you come back?"

Achuar stared at the guards until they released him. He addressed the council. "I have been once more to the other world, but my place is here, with my people. I request permission to rejoin the tribe."

"You have been banished. Why should we allow you to return?"

"I have seen the ways of the other world," said Achuar, "and I have shown their people our ways. The two worlds have become as one. Our spirit will live; our world will be reborn."

There was a murmur of reaction from the elders, but the chief demanded silence. He looked intently at Achuar and pondered. Finally he spoke. "You must prove your worthiness. Do you have an offering for the council?"

"Yes, an icaro I learned in the forest."

Achuar sang the song of the jaguar. The elders were startled by the animal's sudden appearance. They nodded, acknowledging Achuar's power.

But the chief was not impressed. "That icaro is of *our* world; I have heard the jaguar's song many times. You must show us the other world."

Achuar hesitated, then began to sing once more. At first, the elders looked at each other in confusion, not understanding the strange words. The warrior who had also been to the other world stood and joined Achuar in the singing of the icaro.

"... szop for thuh lay-dest ree-al-eh-dees, at ree-al-eh-dee fac-tor-ee."

A series of images flooded into Achuar's mind. He knew he had sung well, allowing the elders to see with clarity these glimpses of the other world.

The chief looked puzzled. "What is the meaning of these visions?"

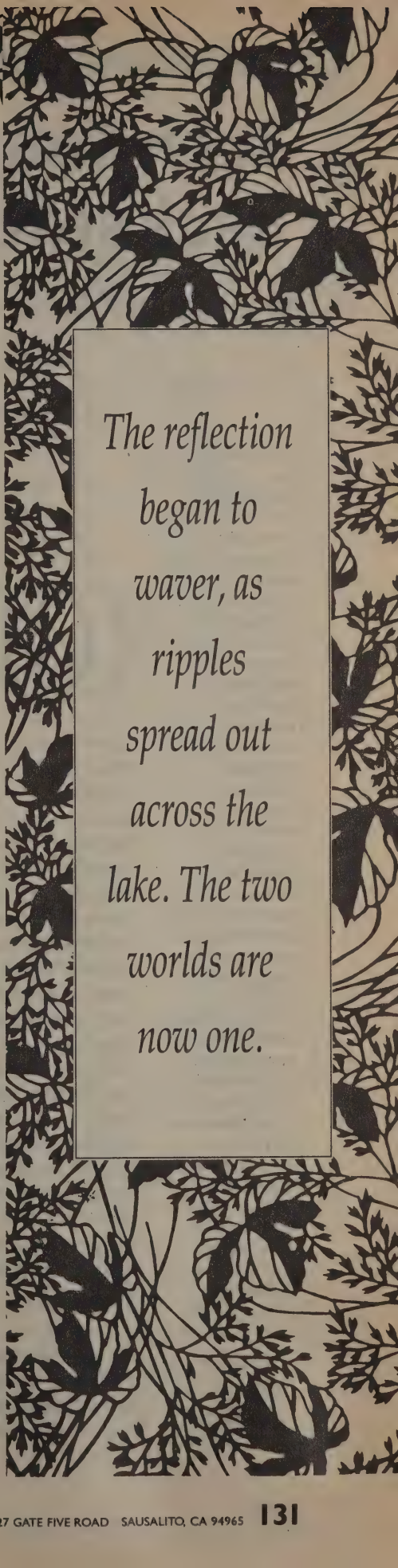
Achuar started to explain all he had seen, but he realized his words would not be understood. He spoke simply. "The people in the other world are powerful shamans. They have great spirit tools which produce magical visions, but their visions are empty and dead. We must teach them the proper use of the spirit tools. In return, they must teach us how to survive as our world changes."

The chief stood and addressed Achuar. "You have seen many strange things. You have been brave in spite of fear, and your actions bring hope for the future of our world. But Achuar may not rejoin the tribe. The boy, Achuar, was banished forever. He is dead."

The chief paused. "If you wish to be reborn into the tribe, you must choose the name of a man."

Achuar thought for a moment.

"I wish to be called *Reed*." ☘



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Technology's Backside

BY MARSHALL P. SMITH

When you look at it right, technology is funny. Early-twentieth-century American cartoonist Rube Goldberg made a career out of lampooning crazy inventions, and Charlie Chaplin's *Modern Times* was a technological tragedy-comedy in the early years of cinema. But people aren't laughing as much these days. When this issue started to coalesce, one of the people who came to mind was Marshall Smith, because I remembered that he reads old patents for laughs. Technology has played a lifelong part in altering the author's perspective: his early years were spent in remote parts of Alaska, where his father was involved in building the DEW line. He went to high school in Richland, Washington, near the Hanford Atomic Plant, where the fissionable material for the first nuclear weapons was produced. "My high-school football team was the Richland Bombers," he recalls. —Howard Rheingold

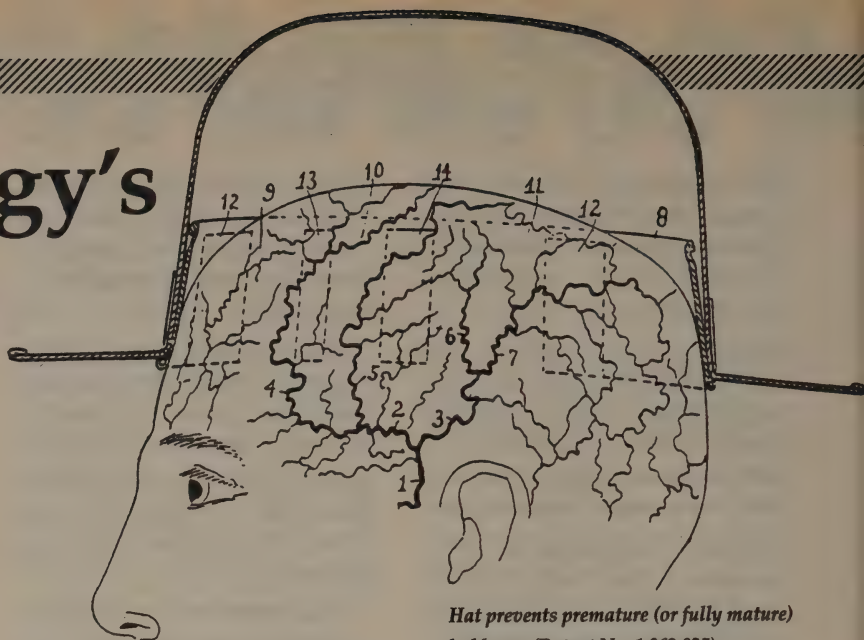
WHENEVER PEOPLE GET euphoric about technology, I can't help remembering a scene from my boyhood in Alaska in the 1950s. Two ancient Athabascan ladies often sat together on a bench outside the local trading post. They didn't speak a word of English and I couldn't follow their language, but for some strange reason they thought the white man's machines were the funniest things they had ever seen. Bicycles and automobiles made them chuckle; airplanes and helicopters had them howling with laughter and holding on to one another to keep from falling off the bench. As a boy I never could understand what they were laughing about, but now I know what they found so amusing. There definitely is something funny about the machines and gizmos that infest our daily lives. Most of the time, the funny part of technology is concealed, or we ignore it. But America has a technological subconscious in Washington, DC, a place that magnetically attracts hilarious ideas for dubious new inventions.

I feel that humor is one of the best ways to deal with the layers upon layers of intrusive innovations that other innovations keep telling us are suddenly essential to our existence. I recommend a publication from a government department that lies at the very core of our

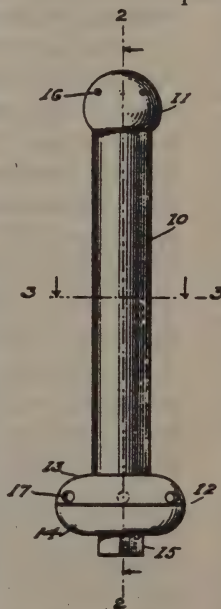
technological past and future — the U.S. Patent Office in Washington.

There's a lot of sex, as well as humor, in the annals of the Patent Office — often both at the same time. Jesse Helms may not realize it, but the U.S. Government publishes a book that features everything from electrically stimulated butt-plugs to fondle-proof crotch armor and a plethora of automated dildos and penis-inflators. That book is the U.S. Patent Office *Official Gazette*. Within its pages one may find everything from a strap-on windshield wiper for the rear end of a horse to eyeglasses for barnyard fowl. Want to improve your appearance? Try the dimple drill, a drill with a dull bit that is used to create artificial dimples. Worried about your breath? Then strap the rubber bladders and tubes of the self-tester for halitosis (Patent No. 2,780,200) on your face and breathe easy.

While most of the entries in the *Official Gazette* are conventional modifications of technology already in use, every now and then one comes along that seems destined to raise eyebrows. For example, Patent No. 2,619,084 — a series of tiny metal hooks designed to be inserted under the skin of the scalp and forehead and then pulled taut with rubber bands to banish facial wrinkles.



Hat prevents premature (or fully mature) baldness. (Patent No. 1,062,025)



Personal piping: silent flatus diffusion for the dainty. (Patent No. 1,273,665)



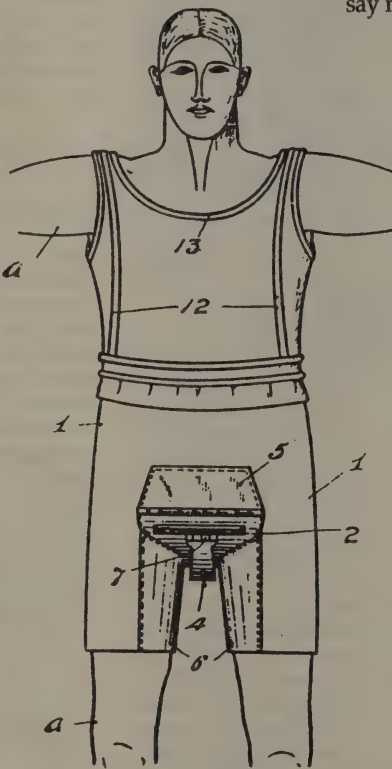
Scalp anchors pull away wrinkles for a trampoline-like face. (Patent No. 2,619,084)

In the silent-film era, there were a number of interesting attempts to bring speech to the movies. My favorite one was a patent given in 1917 to Charles F. Pidgin of Winthrop, Massachusetts. His technique was to have

the character's speech written on a rubber balloon dangling from the actor's mouth. As the scene progressed, the actor would blow up the balloon.

Another simple but supposedly effective device was a "sleeping collar" made of metal that was patented in 1885. When the wearer of the metal collar wanted to go to sleep he simply tightened a thumbscrew on the side of the device until the flow of blood to the brain was constricted (according to Fanny Paul of New York, who patented the device), thus "restoring quiet to the brain in persons suffering from wakefulness or insomnia." Ms. Paul didn't mention anything about waking up.

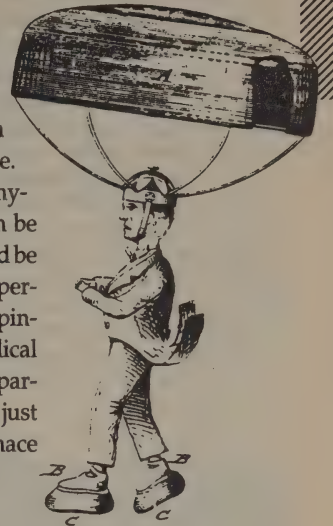
Among the more frightening patents I discovered were ones targeted for the world of children. A dentist from Richmond, California, patented little upper and lower sets of empty dentures that you'd set up on



the mantelpiece and slowly fill with tiny teeth as your child's baby teeth fell out. Thank God that one never caught on. Another patent for children is a truly heinous invention: Patent No. 3,299,891 — the bunny syringe.

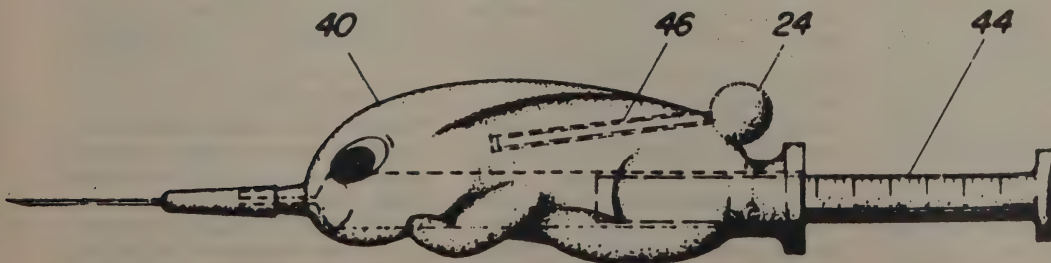
Designed to lull children into getting those awful shots they hate so much, the bunny syringe is a plastic replica of a playful bunny with a needle for a nose. After giving the shot and removing the hypodermic needle, the bunny syringe can be given as a toy to the youngster. This would be enough to cause any child to develop a permanent bunny complex. In my humble opinion there is something particularly diabolical about this whole concept, and I urge parents everywhere to stand up and just say no to the spreading menace of the bunny syringe.

U.S. Patent No. 1,273,665, the Rectal Ventilating Deflator, was an example of Yankee ingenuity at its most basic. This 1918 patented device was a three-inch-high hollow metal tube, equipped with various bumps and protuberances, that was designed to be inserted in the rectum to produce a constant noiseless venting of digestive gases. The Ventilator also featured hook-ups for a power cord to facilitate the "electrical treatment" that was popular during that era. I don't know exactly what this "electrical treatment" entailed, but just thinking about it makes me glad it happened before my time. ☹



Fire-escape cap and landing shoes. (Patent No. 221,855)

"Sexual armor" — the original Man in the Iron Mask? (Patent No. 875,845)



Hey kids, it's Spike the Bunny! (Patent No. 3,299,891)

The Six-Lesson Cynic

Like Mr. Gatto, I'm 26 years a language and literature teacher. I've reread "The Six-Lesson Schoolteacher" [WER #72, p. 96] about 25 times by now. At first he was really impressive. But the more I read, the more convinced I become of several things that should be offered in apposition, if not opposition to his article:

The fellow is almost too cynical to be alive. Seems to me that if he really believes that that's what his career is about, he needs a different job. I couldn't bear to go to work if I really believed that what I was doing was creating a permanent under-class. I fancy that I'm creating "doctors, lawyers, and Indian chiefs" (and hopefully a few good teachers!), and that my class is indeed the route out of the under-class. If I believed what he's saying, I'd have to quit. And I'd have to call for the abolition of the public schools as we know them.

Each of the six lessons is true enough — at least in isolation — at least some of the time — but when he lays them out as the total experience, I just can't buy it. On the other hand, even as I think I can't buy it, I think about Winston Smith, the "hero" of George Orwell's *1984*. His notion was: *If there's hope, it is in the proles*. At least they are free. We teachers, architects, and the like who populate the middle class don't control our own lives. Here we are making a nice "party" income, if I may push the *1984* envelope a little, and we're not really "making it." I hear about people who are perfectly happy on a couple of hundred dollars a week or less and wonder, how are they making it? Too many of us in the middle class are prisoners of the almighty dollar, worshippers of MAMMON.

Lesson Four explains to me why teachers remember the "bad" kids: Basically, they're more interesting than the sheep who make up the vast middle. I remember the top and bottom 10% of my kids pretty well — in between are Gatto's underclass, those folk we commonly call the middle class. To the kid who goes to college to prepare to, say, teach, then comes home and clerks in a hardware store while he waits for a teaching job in this community, I say: Geez, kid, get a life!

Gatto offers us kids as self-teachers after 50 hours. I'm sure even Gatto needed more guidance than that. The theory is great, that our kids would be better off in the library than in college, but the fact of the matter is that society has so little "grip" on kids, leaves them to their own devices so much of the time, that it's little wonder that so many of them end up in trouble. Self-direction calls for far too much self-discipline — a skill we learn apparently only after we learn to hate externally imposed discipline. Even now,

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We pay \$15 for every letter we publish.

what percentage of our reading is "good for us" as opposed to "entertaining?" And what proportion of our reading time is spent in front of a television, whose only purpose in being is apparently to keep us from thinking.

I believe there's a logical fallacy in the suggestion that "there is only a small number who see the better way." The reader is supposed to be made to think, "What a fool I am for not seeing a better way. . . ." Gatto, if you've got a better way, get to it. All the signs suggest we need a better way desperately. Yet, when we compare American public education to Japanese or German, our product is easily as good and much less costly. Consider, for instance, the causes of the alarmingly high suicide rate among Japanese teens. Do we want our kids to be pressured like that? Not my kids, thanks! I'd suggest that what we need is parents who care about their kids enough to spend some time with them rather than money on them, who care enough about their kids to teach them *by example* the value of old-fashioned things like commitment.

Every time I hear how badly teachers are doing, I go back to the example of industry. In industry, when we received defective parts, we didn't continue to make the product with those parts, and we didn't re-machine those parts, and we didn't think, "Hey, let's make do with what we're getting." Kids who bring themselves up because no one gives a damn about them are *reject parts* in a business sense — and even with many, though unfortunately not all of them, we do better than anyone has any right to expect. To put it another way, I'm proud of what I do, despite of all the dumping on teachers have had from the business-oriented public. The worst kind of dumping on me is that of a colleague, even from one who's halfway across the country.

Now I don't know Mr. Gatto. If he has a terrific classroom presence, bedside-manner doctors call it, then he might be okay. If he's exaggerating here for effect, he might be okay. If this is the attitude he really brings into his classroom, then I'm glad my kids aren't there, for with the cynicism that underlies this attitude, he's as genuinely dangerous as anyone who takes away another person's series

of beliefs without replacing it with something hopefully better. For his sake, I hope that much of the essay is just the result of a really severe case of burn-out, and that he came back to school this fall ready to give the kids double their money's worth — which is apparently the job of every teacher.

My purpose isn't to destroy Gatto's argument, but to put it into a bit of perspective. What he's given me is a little dose of angst that I'll cure by spreading it around a bit. I've made several sets of photocopies of the article for distribution among my colleagues. I'd certainly not claim to be a "great" teacher, whatever that means, and I'm certainly not enough of a politician to do what one might have to do to become "State Teacher of the Year." There's no more worthy function that *Whole Earth Review* could provide than to open a sensible national forum about the nature and/or function of education in a society. Will we find consensus on what we want or need from our schools? I suspect not! Yet such a forum might make us more ready to agree to disagree, and that might be an acceptable position from which to start.

Hugh Foster
Manitowoc, Wisconsin

The Six-Lesson President

Forget Mario Cuomo. The New Yorker we need is John Taylor Gatto. Why isn't this man in New Hampshire right now, lining up votes? He writes so well, so simply, with such passion and wisdom, I don't see how anyone could rebut his condemnation of schools and schooling. He seems to have found the very core of our inability to stop the Great Downward Slide.

The truth is a shocker when someone shows you what's been staring you in the face all your life, unseen. The "of-course" reaction snaps into place so fast it's breathtaking.

Malcolm Wells
Brewster, Massachusetts

Logrolling the Spotted Owl

Marylee Guinon forwarded this response to her article "Planting for Disaster" (#72, p. 56), about the need for migration corridors for plants as well as animals.

—Richard Nilsen

Dear Marylee Guinon,

Yesterday I testified at a federal hearing, put on by the Fish and Wildlife Service to support their designation of critical habitat proposed for the spotted owl. Its main thrust is saving the ecosystem with linkages to other ecosystems from Washington down into California, as the strategy for saving this indicator species. I com-

mended them on the approach and read a reference to your article into the record. I had to wait through four hours of testimony before I could speak and I was the first proponent for the ecosystem. The Service really got bashed by the timber corporations and logging communities. During a break a Fish and Wildlife official stopped and thanked me and said they really need to hear from us. Just wanted you to know whose hands your info's falling into.

Jean Stam
Olympia, Washington

Low-Roll Water-Filter Access

I opened my new Fall '91 Campmor catalog [810 Rte. 17 North/Box 997-N, Paramus, NJ 07653-0997] and found the Basic Designs Water Filter [#72, p. 44] for \$59.99 (you have it for \$72.99 from Basic Designs) and the Water Tech Water Filter for \$19.99 (you have it listed at \$28.60 from Magellan's). We count on you guys a lot, maybe you could insert this in the next issue.

Jeffrey McMeans
Simi Valley, California

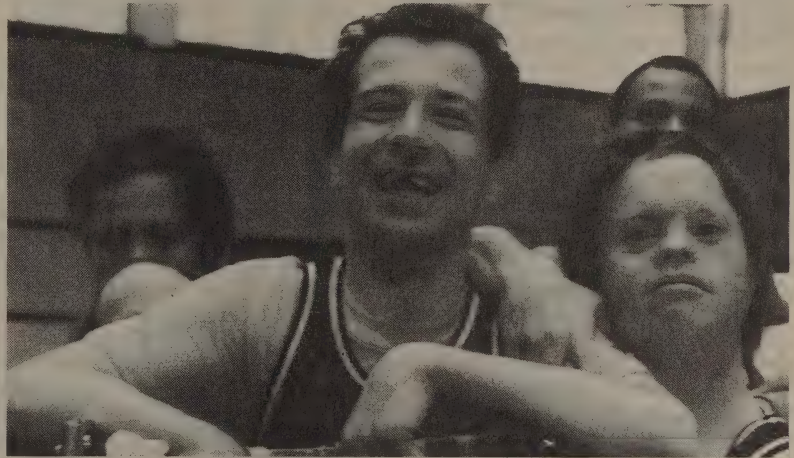
They're Special, But They Don't Give Good Nielsen

Well, once again you scooped Hollywood! This time by a full four years. In the Fall '87 issue of *Whole Earth Review* you published the story of "The Team That Never Lost A Game" ["B-Ball," #56, p. 30]. Now that story is going big-time NBC TV with John Laroquette moving from Night Court to the basketball court. This NBC feature, entitled "Good Enough to Win," is to air in December '91. Much to my pleasure the film includes Joe Asaro and some of his Wildcat teammates. I'm sure Hollywood will ballyhoo Joe and the Wildcats. And the Special Olympics will celebrate Joe as one of "their success stories"! The irony is that Joe and the Wildcats are not being allowed to participate in future I.S.O. Games because they are *not good enough*. "The Team That Never Lost A Game" might never play again!

Every day Joe stands before me with his absorbing smile, unaware that his basketball world is about to end. What Joe does not know is that he and his Wildcat teammates are not being allowed to play in future Special Olympic Games. You see, the International Special Olympics has decided that only skilled athletes — *those who can pass a skills test* — will be eligible for team sports. Coaches are now required to choose and train only the best athletes. There is no provision for the athlete that drools or sits in a wheelchair or can only show success with the wig-

gling of an eyebrow. There is no provision for a Wildcat named Audie that shoots at the wrong basket. Or Michael, who is getting old and tends to stand at center court like the Statue of Liberty. Or Leonette, who hugs the opposing players. Or a player named Joe Asaro, who took 15 years to make his first basket. And is just now learning to dribble.

As the coach of the San Francisco Special Olympic Basketball Team — the Wildcats — I don't know what to tell Joe and his teammates. How can I explain that they are no longer welcome to play basketball in the Special Olympics? That all their years of practicing mean nothing? That according to the Special Olympics they are not good enough to play. How do I answer Joe when he points to the scoreboard with the basketballs and smiles? What can I tell the Wildcats who proudly wear their Special Olympic uniforms



under their street clothes? These gentle warriors have taught me so much about winning. Freedom, and the exhilaration of playing in a game in which the scoreboard changes and it doesn't matter. A game we called special because everyone was encouraged to play and find success.

Every Thursday night for the past ten years the Wildcats have been practicing and playing basketball against all comers — some sixty men and women against competition that includes the local police department, Beach Blanket, churches, Willie Brown's All-Stars, county Special Olympic teams, corporations, schools, and prisons. The Wildcats have a record of 135 wins, 0 defeats, 1 tie, 3 arrests and only 1 conviction. Yes, we cheat! And yes, we change the rules to vitalize the game and give everyone the chance to succeed. But, as our opponents will gladly attest, winning is more than finishing first.

In an era in which the mentally and physically disabled have fought for *equal access* to public education, transportation, work sites, and recreational facilities, it is inconceivable that the International

Special Olympics advocates a policy that blocks access to its team sports for the less skilled and wheelchair athlete. The International Special Olympics policy of choosing the best athletes for team sports, and spending resources and accolades on that select number, is at best a service for fewer and fewer athletes. And the suggestion that "motor activities" take the place of team sports for the less skilled athlete is at best an accommodation reminiscent of *segregation and separate but equal* facilities. If the Special Olympics is to have a philosophy that "everyone wins," then "everyone must have the opportunity to play"!

I know this is not a "big story" but I think it's an important story for people who can't speak for themselves. A mistake that needs to be righted. And a significant story for all of us because it has to do with our national concept of who gets

to play and what we call winning. Surely there is a place in our lives for Joe Asaro and his basketball team. A place for differences. A place for a game in which the players make up the rules to give the game its vitality. A place where winning is a gentle hug and a perpetual gap-toothed smile.

I suspect what is happening to Joe Asaro in team sports is occurring in every community. But it's hard to challenge the International Special Olympics. Coaches like myself have been a loyal part of this crusade for years. And what the I.S.O. is doing for the more skilled athletes is right! They deserve the opportunity to push against the barriers of acceptance. To accomplish all that is individually possible. Or play in *Unified Sports Teams* composed of mentally disabled and non-disabled athletes. This effort must be applauded! But all the applause and performances by Prince or speeches by Arnold Schwarzenegger cannot be allowed to prevent the less attractive, less trainable, less successful athlete from being allowed to participate in Special Olympics team sports.

Yes, we need champions and stars, but

stars of endeavor as well as skill. Stars that drool, perseverate, and have protruding tongues. Stars that play for the joy of the game and not just the victory. Stars that represent friendship and freedom to do your best. Sports gives us all this chance to be a star. For, like Joe Asaro, if you think you are a star — you are! And like Joe Asaro, if you treat the people around you like stars — they are! To eliminate Joe and the Wildcats from our sports life is to darken our universe. And our hope for a better world.

Ron Jones
San Francisco, California

Rover Agonistes

We're all friends here, right? Well, okay, maybe not *friends* — but I've been around long enough to have my say, hey?

I just received my tear sheets and, actually, my copy of *WER* as well. I was very unhappy to find that something was inserted into my article ["Renting With Rover," #72, p. 119] that is *blatantly untrue*, something for which there is *absolutely no basis other than prejudice*, and I am severely pissed off about it.

The sentence is "There is a lot of prejudice — *often justifiable* — against big dogs, even in dog-friendly housing."

As the owner of a big dog who suffered a tremendous amount of prejudice because of her size, I'm here to tell you that the prejudice against big dogs is most likely *not in the least justifiable* and that there is absolutely no proof otherwise. I am furious that you used my own article, under my name, to further this myth by inserting something I did not say, would not say, and in fact, something I try to help other people overcome because of stupid comments like the one in "my" article in *WER*.

If I had a dollar for every time someone told me that I "needed" a yard, a house in the country, a smaller dog, or a cat, I'd have more money than what I was paid for the article in the first place.

DOGS ARE INDIVIDUALS. What mat-

ters is the behavior of the particular dog, *not its size*. A Great Dane can function perfectly well in a studio apartment (I've seen it). A little dog can be an uncontrollable barker. The person who decides what environment is most suitable for my dog is *me*, not the clearly more advanced dog behaviorist who inserted that



comment. (But, hey, that person is not alone — dog owner Mary Randolph managed to smear big dogs in *Nolo Press's Dog Law*.)

After all that hoo-ha over using a reprint of this article, I will specifically ask that this article *not* be used in any SF SPCA info packet.

I want an apology and a retraction. Stupid, stupid, stupid.

Kathleen Creighton
San Francisco, California

I asked that "often justifiable" be inserted in your statement, out of concern for WER's credibility and responsibility.

Mary Randolph's Dog Law was reviewed in WER #65 (p. 102). —James Donnelly

Arpdates, Corrugations & Eclair Factions

• From *WER* #72 (Fall 1991):

Antero Alli's correct address (p. 29) is P. O. Box 45758, Seattle, WA 98145.

Good Grub For Good Folks (p. 34) has bit the dust with "no forwarding order on file."

Notes From Windward (p. 35) is \$2 per issue; a year's subscription (8 issues) is \$15.

Household EcoTeam Workbook (p. 55) and *Global Action Plan* have moved to 57A Krumville Road, Olivebridge, NY 12461.

The area code for SAIC Newsletter (p. 78) has been changed to 510.

1990/1991 Directory of Intentional Communities (p. 111) is now in its second edition and costs \$16 (\$18 postpaid).

• From *Whole Earth Ecolog*:

The *Permaculture Activist* (p. 46) has a new editor, address, and price. The access is now: *The Permaculture Activist*; Peter Bane, Editor; \$16/year (four issues) from *The Permaculture Activist/Subscriptions*, P. O. Box 3630, Kailua-Kona, HI 96745.

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The Unclassifieds are a reader-to-reader service available to *WER* subscribers only. They're designed to provide a cheap communication network for *WER* readers and mild financial assistance to the magazine.

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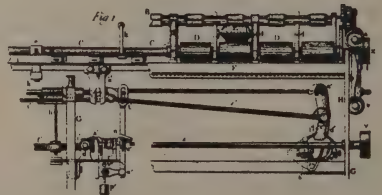
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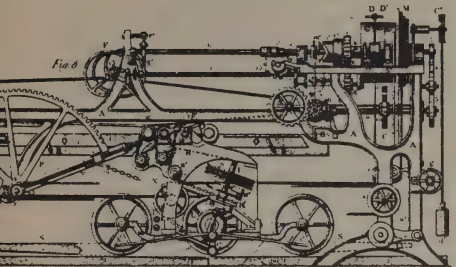
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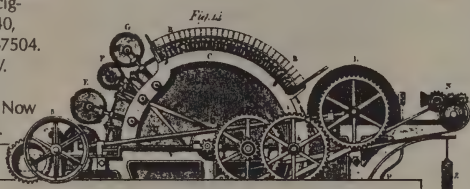
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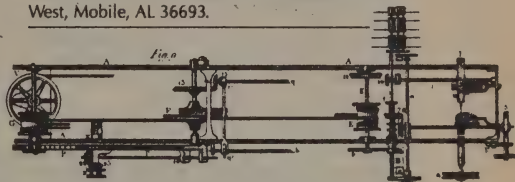
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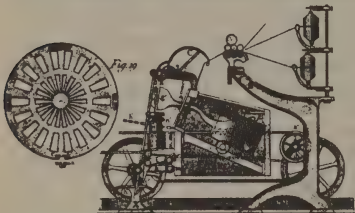
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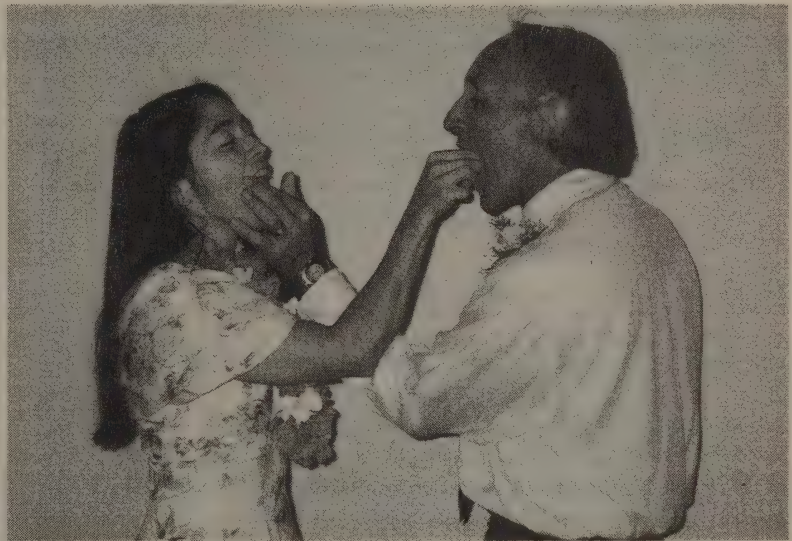
GOSSIP

J. Baldwin, who has been a Whole Earth editor since the first days of CoEvolution Quarterly, wins the Gate Five Road award for most adventures in a month. JB and horticulturist/jeweler Liz Fial, his partner of eleven years, were married in a family ceremony at the nature preserve on which they live. For a honeymoon, they drove their much-modified sixteen-year-old Toyota/Chinook camper through 8,000 miles of Alaska. "The place is still wilderness worth fighting for," say J. and Liz. The day after they returned, JB received a new heart valve; he says he drinks a Quaker State Smoothie each morning with breakfast.

The cast of characters, and the functions, around Gate Five Road are changing, as ever. Su Rosberg, the Customer Service goddess with the happy voice, took a trip through the Southeast in August. She and spouse Jerry Fried fell in love with Georgia; our loss is Savannah's gain. If you have called our office and conversed with a woman whose smile comes through the telephone, that was Su.

We welcome in her place our new Administrative Assistant, Nancy Bellaci, who worked for years at St. Rose's Academy in San Francisco.

Sarah Satterlee promised me that she would be my metaphysical lighthouse for a year, which was how long I thought I would be doing this job. The year is over and Sarah needs full-time employment, so she's out looking for that. By the time this is published, Sarah probably will have found something. But if you are struck by the revelation, as I was, that what you need in your operation is someone with soul as well as competence, you can contact her through us. The happy side of the change is that Robin Bishop has found her way through the strange labyrinth of the Whole Earth hiring process



and training program, and is filling the telepathic niche outside my door.

Kurt Grubaugh, formerly our Fulfillment Person, has taken a computer-systems job at Colossal Films. Kurt was with us for a year. He was the fellow who upgraded the computer systems in the editorial offices and helped when our information tools began doing nasty things. Thanks, Kurt, and good luck.

Linnea Johnson comes aboard as Customer Service Manager, to take up two-thirds of Kurt's workload and some new tasks besides. She's a nearly native San Franciscan who returned to the fogbound city after receiving an MS in mathematics from the University of Oregon.

Changes at the WELL, too: David Hawkins, former System Operator, took a job at Sybase. David was much more than a System Operator. He patiently helped many of us learn our way around the baf-

fling computer lingo we had to master in order to do what we really wanted to do — communicate with each other. And he was there to help us grow from a collection of strangers who traded words on computer screens to a real community. Whenever somebody was sick or in the hospital or going through hard times, David paid a pastoral visit; he was a member of the community for years before he became an employee of the WELL. He did it because he cares about people and is enthusiastic about the use of computer conferencing as a community-building medium. Thank you, dhawk. We appreciate you. The WELL's success and growing user base are leading to growth in several directions. Four of the WELL's nine employees have joined the staff in the past several months: Welcome to Customer Support People Matisse Enzer and Mark Faigenbaum, System Administrator David Gault, and System Operator Kevan Garrett. —Howard Rheingold



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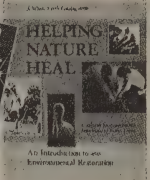
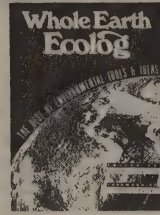
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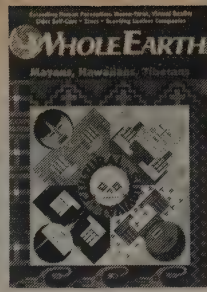
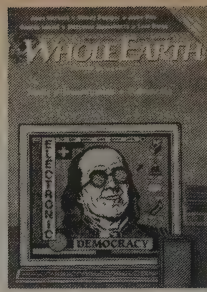
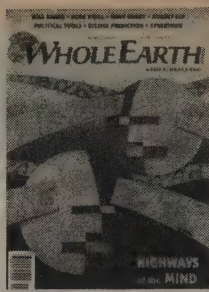
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“NEWS THAT STAYS NEWS” is how we like to think of what we publish. Many of our old issues are remarkably timely since we often cover topics several years before other publications do, and because our old interests keep resurfacing as news.

Our most recent issues are described below. Write us for a complete listing.

67. Summer 1990 — Biosphere II, an airtight glass ark for eight people and 1,000 species of wildlife to be sealed for two years in Arizona; artificial ecology and flocking robots; the solar-powered cottage; a book Stewart Brand won't write; rats as housepets. **\$7.**

68. Fall 1990 — Learning from the earthquake, by Stewart Brand; European organic agriculture; the FBI blunders into the electronic frontier of cyberspace; junk mail backlash by fed-up addressees; special section on Radio Earth. **\$7.**

69. Winter 1990 — Access to Japan, including: the origins of Japanese group-mindedness; Michael Phillips on US-Japan relations; Bruce Sterling on Japanese pop music; the role of whaling in Japanese culture; Japanese environmental groups. Plus Murray Bookchin and Dave Foreman. **\$7.**

70. Spring 1991 — Determining the future of a nationwide information and communication network; access to political tools

and access to poetry; laughing your way to health with the Gesundheit Institute; do-it-yourself eclipse prediction, by William Calvin; Cyberthon 1.0. Plus Wavy Gravy, Will Baker, Robert Bly, Gore Vidal. **\$7.**

71. Summer 1991 — Global and local electronic networking by citizen activists; myths and dreams: interviews with Wendy Doniger and James Hillman; storytelling, from multimedia to native American traditions; "Snake Talk" by Anne Herbert; Lara Owen on menstruation; Ecuadorian shaman Mercedes Mamallacta. **\$7.**

72. Fall 1991 — Extending human perception with Nightwalking, lucid dreaming, virtual reality, psychedelics, and Neuro-Tarot; cultural survival of Hawaiians, Mayans, and Tibetans; eldercare; Renting With Rover; Art Kleiner on corporations. **\$7.**

PRICES:

Plentiful issues (any *not* listed below): **\$7** postpaid.

Endangered issues (fewer than 30 in our archives): #4, 10, 13, 14, 50. **\$50.**

Rare issues (fewer than ten in our archives): #1, 52, 57, 64. **\$100.**

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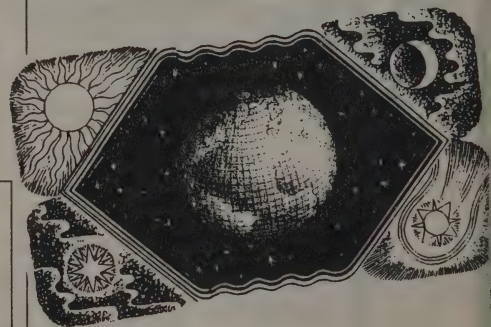
Bound photocopies of Endangered and Rare issues are also available for \$30.

Issue 27 was *The Next Whole Earth Catalog*; it is not available as a back issue.

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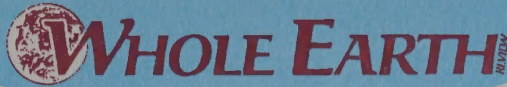
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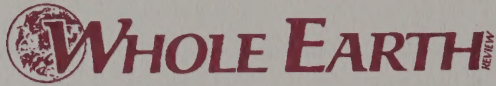
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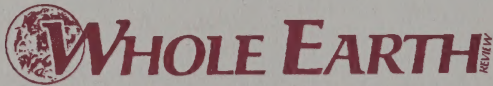
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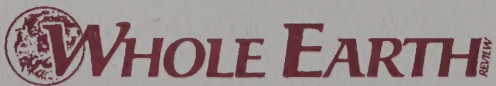
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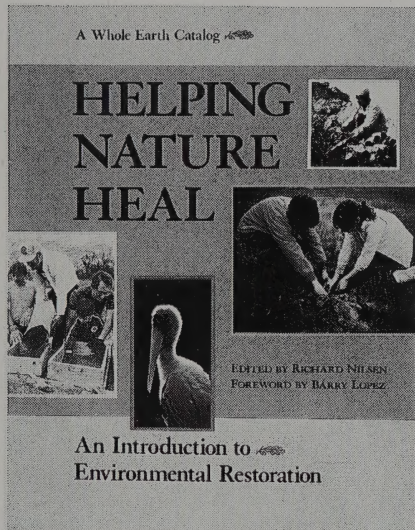
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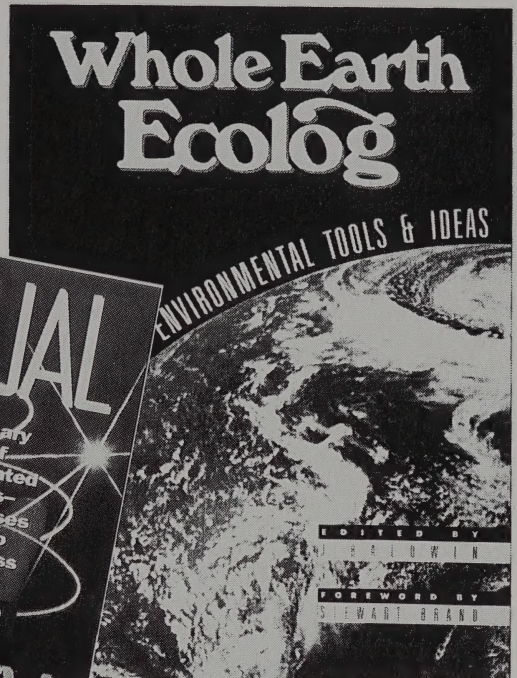
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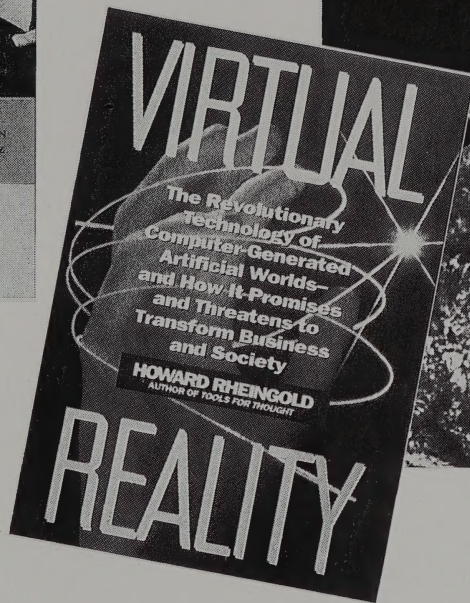
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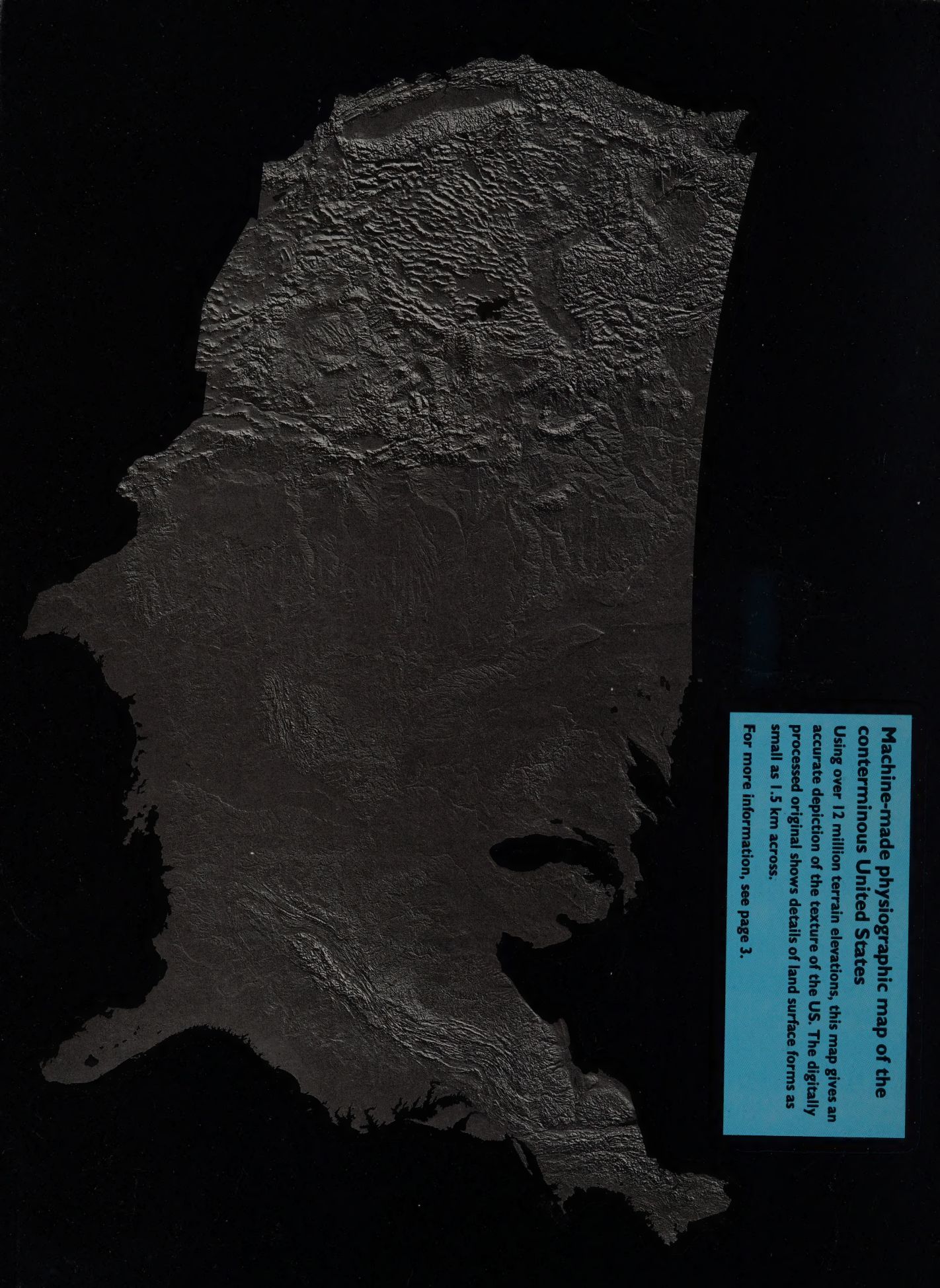
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